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The Farmer's Digest

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The Farmer's Digest

Volume 11 April, 1948 Number 11

Good Management Pays in Farming

Condensed from Capper's Farmer

M. L. Mosher

Farm Management Extension, University of Illinois

THE most amazing fact learned from 30 years of studying records kept by Illinois farmers is that one fifth of them farm enough better than another one fifth, so that the difference in net earnings of the two groups would pay for the most productive farms in 15 to 20 years.

These differences in earnings are due to differences in management.

The wide differences in earnings occur year after year regardless of whether average earnings are high or low. They show up regardless of the area in which farms are located. The proportional differences are about the same on poor land as on land in the better soil areas. The differences persist on the same farms even in drouth years.

Here is an example of how good management increases farm earnings:

There was an average annual difference of $2,960 per farm between the most profitable one fifth and the least profitable one fifth of 175 farms in the Farm Bureau Farm Management Service in the Pioneer Area in north-central Illinois, during 1925, 1926, and 1927. As depression and drouth years came on, this annual difference in the same area (many farms were the same farms) dropped to $2,390 per farm during 1929, 1930, and 1931, and to $2,270 during 1932, 1933, and 1934. As the general level of earnings increased, the difference became greater again, being $3,030 per farm per year during 1936, 1937, and 1938, $5,020 per farm during 1940, 1941, and 1942, and $7,100 per farm during 1944, 1945 and 1946. A relatively small part of the larger differences during later years was due to increases in the average size of farms.

In one north-central Illinois

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county are 2 farms on which accurate records have been kept since 1925. Both are quarter sections, have the same quality of soil, are only a few miles apart, are operated by men of the same age, and each man grew up on the farm he operates. During 22 years, 1925 to 1946, per acre net earnings amounted to $301 more on one farm than on the other.

Two other farms in the same area of Illinois are one-half section in size. They are 6 miles apart, have the same quality of soil, are farmed by men of the same age who grew up in the community. Net earnings during 22 years of operation amounted to $110,000 more on one farm than on the other. The man who did a good job of managing, real ized $5,000 a year more than his neighbor.

Based on the study of farm records kept by thousands of Illinois farmers in all parts of the state during the last 25 years, a 15-point formula for good farm management has been worked out. The first 10 points have to do with the production and use of income.

Point No. 1. Sound land-use and soil-conservation program. While some farms are temporarily profitable because a process of soil-mining is being used, on most of the more profitable farms sound land-use and soil-conservation programs are being followed.

Point No. 2. Good rotation and field arrangement. Good rotations are found on all farms which are profitable over a long period. Farm records indicate that a good rotation on good corn land in the heart of the Corn Belt provides: (1) For first year, corn always to follow 1 or more years of a good soil-building legume such as alfalfa, red clover, or sweet clover used for seed, hay, or pasture. (On the best level, black corn land for a part of the time corn may follow sweet clover plowed under at the end of its first year of growth.) (2) For second year, corn to go on the best black corn land not subject to serious erosion, and especially on farms where there is enough livestock so the second-year corn can receive from 6 to 10 tons of feedlot manure an acre. Soybeans may well replace second-year corn in cash grain areas. (3) For a small-grain crop that is used as a nurse crop for the legume and grass that follows. (4) For one or more years in a good soil-building legume (except on some bottom land or in the cash-grain areas of the best corn land where sweet clover plowed under at the end of the first year may be used to supply nitrogen). The number of years that land should be left in legume and grass varies from 1 to 5 or more, depending on the soil productivity, the slope, and the livestock program.

Point No. 3. Suitable kind and amount of livestock. Livestock is not essential for profitable farming on medium to large farms on all-tillable good corn land. However, records show that the most profitable farms always are livestock farms on which livestock is well-handled. Hogs and beef cattle fit well on good corn land farms where labor supply is limited. Beef cow herds are used successfully on farms having large acreages of permanent pasture and on some cash-grain farms to eat legumes, grasses, and roughages produced under a good soil-conservation program.

Dairy farming fits into areas where markets are favorable and where large quantities of good roughages and plenty of family labor are available. Many profitable farms have made good use of poultry to employ family labor and provide for a regular income to pay current family expenses.

The effect of the next 4 items, high crop yields, efficient livestock, carefully planned use of labor, and effective use of power and machinery, on farm earnings, is well-illustrated by data from the Three-Year Report of 193 Farms in the Illinois Valley Farm Bureau Farm Management Service for 1943, 1944, and 1945. The farms are in north-central Illinois and averaged 271 acres in size, 86 per cent of which was tillable.

The average annual net earnings were $8,400 per farm during those war years. The 22 farms which produced better-than-average crop yields, got more-than-average returns from feed fed to livestock, operated with less-than-average labor costs and less-than-average horse and machinery costs for the amount of work to be done, had average net earnings of $11,200 a farm a year.

In striking contrast, the 15 farms that were below the average of all farms in each of the 4 factors, had average annual net earnings of only $4,800. The recorded earnings of both groups of farms were adjusted so differences in earnings were not due to any differences in size of farm. Neither was much of the difference due to quality of land.

Point No. 4. High crop yields. Of the $6,400 difference in annual net earnings between the 22 farms with all 4 factors above average and the 15 farms with all below average, $1,600 was due to the difference in crop yields. Eighty per cent of income from all farms was from livestock. In cash-grain areas, a larger portion of the difference would come from having high crop yields.

Practices followed by those who obtain highest crop yields include: (1) Use of regular rotations which provide for a soil-building legume immediately ahead of the major grain crop; (2) use of limestone, phosphates, and (during recent

years) potash where soil tests indicate their need; (3) careful use of all available manure (cattle farms are high grain yielding farms because of the manure and the legumes grown for hay and pasture); (4) use of seeds recommended by the Agricultural Experiment Station; (5) careful seedbed preparation, planting, and cultivation; (6) control of weeds, insects, and diseases; (7) timeliness of all operations involved in seedbed preparation, planting, cultivation, and harvesting. Many farmers who try to follow a good program do not get high yields because of failure to do certain essential jobs at the best time.

Point No. 5. Efficient livestock. Differences in livestock efficiency accounted for $2,350 of the total difference of $6,400 in annual net earnings between the two groups of farms. This was more than was accounted for by any other factor. On livestock farms, efficiency of livestock production has more influence on net farm earnings than any other factor; on cash-grain farms, crop yields are most important factors.

Effective practices followed by those who profit most from livestock include: (1) use of high-quality breeding and producing animals; (2) attention to health of all livestock, with special emphasis on sanitation, vaccinations, and care to prevent accidents; (3) feeding of well-balanced rations, with special emphasis on use of home-grown feeds; (4) special attention given to purchase of feeding animals and sale of all livestock and livestock products, and, (5) kindly handling of all livestock with gentle attention to pregnant females and all young animals.

Point No. 6. Carefully-planned use of labor. Differences in labor costs were responsible for $1,250 of the total difference of $6,400 in annual net earnings between the two groups of farms. High wages paid during the war increased the importance of laborsaving practices.

Effective laborsaving practices observed on record-keeping farms include: (1) careful planning of all farm work so there is little conflict for labor among different crop and livestock enterprises; (2) thoro preparation for all important jobs so the work, once started can be carried thru without interruption; (3) arrangement of the farm into a few large fields rather than many small ones; (4) extensive use of self-feeders with the feeders, in many cases, out in fields that will be planted to corn the following year, and (5) arrangement of buildings, lots, fields, feeders, and watering equipment to minimize the time required to care for livestock.

Point No. 7. Effective use of power and machinery. Of the $6,400 difference in annual net

earnings of these farms, $1,200 was due to differences in power and machinery costs.

Effective use of power and machinery was obtained by (1) purchase of strong, well-built machines; (2) use of ample power for work to be done; (3) constant attention to greasing and oiling according to instructions; (4) keeping machines in proper adjustment; (5) making note of wearing or weakening parts and early ordering of repairs for their replacement; (6) keeping cutting edges sharp; (7) keeping polished surfaces oiled when not in use; (8) annual overhauling of all machines and equipment and replacement of cracked or worn parts; and (9) protection of machines from weather and livestock.

Point No. 8. Conservative buildings and fences. Most comparisons of high-earning and low-earning farms show larger investments in buildings and fences on low-earning than on high-earning farms. While ample space for storage and protection of livestock, grain, feed, and machinery is essential, many farmers build beyond their real needs. One Illinois farmer pointed with pride to the fine new cattle barn that he had built for $1,500 just before the war. Study of an old horse and cattle barn indicated that he could have remodeled the old barn and provided room for the farm's feed and livestock for $500. The farm will have an unnecessarily large building charge as long as the buildings stand and the present livestock program is continued.

Point No. 9. Attention to prices of products sold. Some livestock farmers profit greatly by studying seasonal and long-time trends in prices of livestock and livestock products and adjusting their production and feeding operations accordingly.

Several years ago, an analysis of the relation of the study of "outlook" to farm earnings was made. It was found that farmers who attended outlook meetings, studied the reports, and kept posted on marketing problems were earnings several hundred dollars a year more than those who paid no attention to such matters. It will pay a farmer to study all matters that deal with the purchase of supplies and the sale of farm products.

Point No. 10. Large enough business for good living. Good farming is not worthy of the name if it does not provide for a satisfactory living for the farm family, for certain contributions for community service and the welfare of one's neighbors, some of whom may be in distant cities or around the world, and for security during old age.

Any young farm family may wisely study with home economic and financial specialists to deter-

mine a reasonable income for its lifetime needs, and then develop a business of a size which, when fairly well managed, will supply its needs. The size of business may be increased in most Corn Belt counties by renting or buying additional land, feeding salable grain to livestock, buying feed for additional livestock, dairying, poultry production, the growing of fruits, vegetables, and flowers, and even the processing and retail selling of some farm products.

The last 5 points have to do with the farmer himself and how he functions in carrying on the farm enterprise.

Point No. 11. Constant study of the farm business. The successful co-operators in the Farm Bureau Farm Management Service are, as a group, more interested in studying the annual farm business-analysis reports, in attending field meetings, in going to the Experiment Station on Cattle Feeder's and Swine Grower's Days, than are the less successful co-operators. It pays to study one's business.

Point No. 12. Timeliness and regularity. The habit of doing things regularly and on time is one of the most valuable habits for a successful farmer. It applies to most phases of crop and livestock production. The parent or teacher who trains boys and girls to do things on time until they form the habit of timeliness and regularity is doing much to help them become good farmers. Of course, the best way to teach timeliness is by example.

Point No. 13. Kindliness, cleanliness, and thoroness. The kindly handling of livestock is essential in order to obtain greatest profits from them. Several years ago I visited several successful livestock men to study their practices. I was much impressed with the fact that nearly all of them were kindly men who were quiet and gentle in the handling of their animals.

Sanitation is the best method of controlling many livestock diseases; cleanliness is essential for good sanitation. Cleanliness is a necessary practice in the production of the best quality of milk and eggs. Thoroughness is a quality that we have observed in many successful farmers.

Point No. 14. The will to do a good job. Unless one has the will to do a good job of farming, he will fail to do a good job.

Point No. 15. Love of farm work and farm life. Most of the best farmers love farm life and have wives who share that love with them. The farmer who likes his work takes pride in doing a thorough job and that leads to farm profits. Farmers who see that their growing children have a certain amount of wholesome recreation and social life are helping them to be happy with farm life and, in an indirect way, they

are also helping them become better farmers.

Any young farmer who will study this formula for good farm management, follow it carefully, and practice doing each part until it becomes a habit, may look forward to a successful farm life.

FORMULA FOR GOOD FARM MANAGEMENT

THE FARM

1—Sound land use and soil conservation program
2—Good rotation and field arrangement
3—Suitable kind and amount of livestock
4—High crop yields
5—Efficient livestock
6—Carefully planned use of labor
7—Effective use of power and machinery
8—Conservative buildings and fences
9—Attention to prices of products sold
10—Large enough business for a good family living

THE FARMER

11—Constant study of the farm business
12—Timeliness and regularity
13—Kindliness, cleanliness, thoroness
14—Will to do a good job
15—Love of farm work and farm life

More Pigs with Alfalfa Meal

Condensed from Iowa Farm Science

Damon Catron and *C. C. Culbertson*

ALFALFA MEAL or ground alfalfa hay can help keep down "little pig" costs in feeding SOWS.

In a recent experiment at Iowa State, we found that by feeding 10 percent alfalfa meal in the rations of pregnant sows, we increased the average number of pigs weaned per litter.

Ration	Number pigs weaned	Percent Livability
Plant protein	6.5	62
Plant protein + 10% alfalfa meal	7.2	73
Plant and animal protein	6.5	69
Plant and animal protein + 10% alfalfa meal	7.5	72

Some farmers have turned to drylot feeding in both summer and winter. This helps overcome swine diseases, parasites, water hauling, fencing, mud and other problems. But it can also lead to poorer feeding. Pasture feeding can cover up a lot of feeding sins which may show up when feeding in drylot. And here is where alfalfa meal enters the picture.

By including alfalfa meal in the drylot ration, you can almost bring summer pasture into your winter feedlot. Alfalfa meal furnishes vitamin A and B-complex vitamins that are so important.

Alfalfa meal or any ground legume hay of good quality can be used for up to 50 percent of the ration for bred sows and up to 30 percent for bred gilts. But any old alfalfa or legume hay won't do. We know that the carotene and B-complex vitamin content of alfalfa varies a lot with the quality of the hay. Only high quality hay will do the job.

A good self-fed ration for sows is 600 pounds of ground corn, 600 pounds of oats, 600 pounds of alfalfa meal, and 200 pounds of protein supplement. This 15 percent protein ration is excellent for hand or self-feeding, during gestation. You may want to hand-feed it this year—to save feed. Even if you don't feed this ration during the year, your sows will do better if you feed some oats and alfalfa for 2 or 3 days before farrowing and during the sucking period.

There are three critical feeding periods in the production of hogs: gestation, lactation and young pigs up to 75 pounds. Feeding the right vitamin and protein supplements during these periods makes stronger, faster-growing pigs. It

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helps build resistance against disease and cuts death loss. Good feeding during these periods will pay dividends in more, stronger, and faster gaining pigs later on.

If alfalfa meal is so good for feeding sows, how is it for growing pigs? In actual practice the answer probably depends more on relative feed prices than anything else. However, adding alfalfa meal can make some increase in rate of gain when used in drylot feeding. Here are the average results for two tests by the USDA.

According to this, using 5 percent alfalfa meal gives more rapid gain and also greater feed consumption. By increasing the alfalfa meal to 10 percent of the ration, we get almost the same gain and the same feed consumption. When alfalfa meal is cheap in relation to the price of other feeds this may be practical. If maximum gains are not desired, feeding as much as 15 percent alfalfa meal may pay.

Percent alfalfa meal in supplement	Average daily gain	Total feed per 100 lbs. gain
0	1.60	358
5	1.74	378
10	1.72	378
15	1.64	394
20	1.56	405

Supplement for	Period	Proportion of Alfalfa Meal in Supplements	
		Percent protein in supplement	Percent alfalfa meal in supplement*
Sow and pig	Bred sows, nursing sows, young pigs up to 75 pounds	30–35	15–30
Drylot hog	Growing-fattening pigs above 75 pounds on drylot	35	20–25
Pasture hog	Growing-fattening pigs above 75 pounds on pasture	40	0– 5

*Or its equivalent in B-vitamins

New Barn—Half the Cost

Condensed from Farm Journal

B. G. Perkins
Doane Agricultural Service, Inc.

FANCY barns are mighty pretty. If you have one, though, chances are you are paying a large share of the cost yourself—your livestock won't.

Livestock can't pay more than 6% to 10% of their yearly earnings as rent on buildings.

That's not very much. With present-day high building costs, it may seem impossible to build a barn within the earning ability of your livestock. It's hard to do if you follow traditional methods. *But why follow tradition?*

Last year a 50 × 56-foot barn was built on the Dr. Charles A. Thomas farm in Pike County, Mo. And it cost only $1,380.20! If traditional methods had been used, it would have cost at least $3,500.

Dr. Thomas built it for a beef barn. However it will do for just as well as a barn for dairy cattle, hogs, or sheep. For dairy cows it would be a loafing barn, and a small milking parlor would be added. It makes a fine shelter for feeder pigs or brood sows, and can be used for machinery storage.

This brand-new, low-cost barn didn't just happen. It's the result of years of research by the Doane Agricultural Service, on how to cut farm building costs. *It's a pole-type barn.*

"Pole-frame construction!" you may exclaim. "Why, my grandfather tried that and discarded it years ago." And so he did, but that was before poles could be pressure-treated with chemicals to resist decay. Even though they're sunk in the ground, these poles will last 40 to 50 years.

Building a modern pole-frame barn is almost as simple as building a fence—just set the poles and nail the rest. No excavations, no footings, no foundations, no anchor bolts and reinforcing, no concrete, and incidentally no all-summer boarding of carpenters.

A couple of men with posthole diggers, who also are handy with a hammer, can quickly put up a good, modern pole-frame barn.

By "modern," we do *not* mean a large, two-story, hip-roof, or similar type of barn, with all its heavy construction to support tons

Reprinted by permission from the Farm Journal and Farmers Wife, Philadelphia, Penna., November, 1947

and tons of hay and feed above ground.

Why not just let the solid earth support the hay and feed, and pocket the money it would have cost to keep it overhead? That's the first principle in low-cost building—single story construction, built close to the ground.

Have you ever thought how much time and money is spent on scaffolding for a regular two-story barn? Sometimes it costs almost as much to build and then remove the scaffolding and foundation forms as it does to build the barn. With the pole-frame barn you eliminate practically all of this "double construction." This means real saving in cost.

Also, low, compact single-story buildings have to resist less wind pressure—another saving. In the pole-type barn, practically all bracing is eliminated, because the poles are firmly anchored. *The building is both supported by them and tied down to them.*

Notching and sawing of lumber is reduced to a minimum. Notching takes time, and reduces the strength of the timbers. Sawing of rafters is eliminated by allowing them to lap, even at the ridge; thereby doing away with cutting a difficult angle. Nail ties along the side walls also lap. All this means that *unskilled* men can build your barn.

So, this barn reduces labor cost at the time it is built—but it doesn't stop at that. It continues to save work the year around. The "Doane drive-through-mow" system is used, so that hay racks, sleds, buck rakes, or trucks can be driven into the storage space and unloaded right where the hay or feed is needed.

No lofts to climb into, no lugging of hay to chutes in feeding, no lugging it to mangers after it has been thrown down. Here you simply roll the hay over against the feeding fence.

Bedding also is right there where you want it—ready to be tossed over the fence into the livestock loafing area. Ample clearance allows you to use power manure-loading equipment—so the feeding, bedding, and hauling manure back to the fields all can be done mainly with machinery.

Still another saving with this barn is in ventilation. It's true, but seldom understood, that the inside temperature of a cattle, horse, or sheep barn should be close to the temperature outside.

One of the chief by-products of a high producing animal is heat. A beef steer on full feed or a dairy cow will lie down in snow, chew their cud, and be perfectly comfortable. Too many of us think livestock should be shut up in tight, warm buildings.

Applying this to our pole-type barn, we can solve our ventilation problem by leaving the whole

south side open. At the same time, three other things are accomplished: (1) less cost; (2) less labor in removing manure; and (3) animals can come and go as they please.

Now here's one more thought. All of us know that farming methods are always changing. A dairy system considered good now may be out of date in 10 or 15 years. In fact, many think that the stanchion barn even now is obsolete.

This pole-type barn is highly flexible. Interior feed bunks and divisions are movable, like furniture in a house.

So there you have it. It's a low-cost single-story structure; feed storage at ground level; and it's wide open to the south. It can be altered easily to fit any new system of farming. What more do you need?

Russian Method of Increasing Fecundity in Sheep

Condensed from Sheep & Goat Raiser

Professor M. Zavadorsky
Member of the Soviet Academy of Agricultural Sciences

For over 12 years I have been engaged on the problem of increasing the fecundity of sheep. At first the work was done on a laboratory and semi-laboratory scale, but in the past five years it has been carried into the broad pastures of the European part of Russia and Central-Asian Soviet Republics. The application of our method to flocks of various breeds (Karakul, Kurd, Gissar, Merino, Rombouillet, as well as mixed breeds) gives us grounds to claim that it has justified itself in practice.

The rapid multiplication of domestic animals is today one of the cardinal problems of agriculture in all countries. Hitherto increased fecundity in animals has been stimulated by improved feed and care. These are tried and tested methods, but there are other ways, namely, by making use of substances which are secreted in the animal organism in the course of its development.

A ewe, as a general rule, bears one lamb, more rarely two, corresponding to the number of eggs which happen to be in the ewe's

Reprinted by permission from the Sheep and Goat Raiser, October, 1947, San Angelo, Texas

ovary at the time of mating. Fecundity depends upon the number of eggs which mature simultaneously. Modern biological knowledge enables us to regulate development of eggs in the animal ovary. If a subcutaneous injection of pituitary body or pituitary extract is administered to an immature ewe (four or five months old) eggs begin to form in its ovary. If a similar injection is given to an adult ewe, three or four or even more eggs will mature in the ovary simultaneously, instead of the usual one or two.

This laboratory experiment was developed into a regular method which has been practically applied to large numbers of sheep.

The essence of the method is as follows: Three or four days before the ewes go into heat we inject into them a serum obtained from a mare in the second or third month of pregnancy. Such a serum contains numerous gonadotropic hormones similar to the hormones of the pituitary body. When mated the ewes treated bear two lambs, sometimes three and more, and in some cases as many as seven. The greater the dose of serum injected (we call it the fecundity serum) the greater the number of eggs which mature, and hence the greater is the fecundity. In practice, however, we find that a litter of two or three lambs is the most expedient, and we accordingly recommend a corresponding dose of serum.

The fecundity serum is standardized on mice, and a dose of 1,000 to 1,200 mouse units are injected into each ewe. In the past five years the hormonal method of stimulating fecundity has been practiced on over 2,000,000 sheep of various breeds and under differing farming conditions. The method has always been applied on a practical scale under our supervision. We estimate that an additional 500,000 lambs have been obtained by this method. Our extensive experience permits us to say that with the recommended doses of 1,000–1,200 mouse units the number of lambs born is increased by about 50 per cent, (160, instead of 107, lambs per 100 ewes), the bulk of the increase being due to the number of twins born.

In the case of Karakul ewes, which, under ordinary conditions of care, bear 93 per cent, single lambs and 7 per cent twins, we get by the use of our method 43 per cent single lambs, 48 per cent twins, 7 per cent triplets, 1.5 per cent quadruplets, and 0.5 per cent larger litters, up to seven.

The zootechnical indications are favorable. The injections have no deleterious effects upon the ewes. Pregnancy proceeds normally, provided feed is adequate and care satisfactory. Lambing

takes place without difficulty.

Abnormal periods of pregnancy and sterility are no higher than in the control flocks. Ewes which bear three and even more lambs lose a little more weight during pregnancy than ewes bearing single lambs, but, with good feeding, this loss is soon made good in the first month of lactation.

When the method is applied from year to year in one and the same flock, the increased fecundity is repeated and remains steady more or less at one level. Lambs from large litters (even of four to seven) are as a rule quite virile. The lambs of large litters in the case of fine-fleece sheep are weaker than those of coarse-fleece sheep. In the first few days the lambs of large litters require somewhat more care and attention than single lambs.

At birth the weight of each lamb of twins is about 85 per cent, of triplets 75 per cent, of quadruplets 65 per cent, and of sextuplets 60 per cent of the weight of a lamb born singly. The better the feeding the bigger relatively is the weight of lambs of large litters. If the mother ewe is well fed the lambs of large litters rapidly gain weight and usually catch up with single lambs by the time of weaning.

If the mother of a large litter is not properly fed and yields little milk the development of the lambs is delayed. If the mother has little milk the lambs of the litter should be given foster mothers or be bottle-fed. Given proper feeding, the lambs of even litters of six or seven develop well and can be good reproducers. It need only be said that yearling Karakul ewes born in litters of four and five attained a weight of 42 kilograms as compared with 54 kilograms of a full-grown ewe.

The method is quite profitable, the cost of an additional lamb being only one or two roubles. The technique is simple and can easily be mastered by the ordinary sheep breeder. We have increased fecundity not only in sheep, but also in cows, goats, and silver fox.

Towering Accomplishments For Agriculture

Condensed from Texas Farming and Citriculture

Clinton P. Anderson
Secretary of Agriculture

PICTURE in your minds the old prairie schooners on a "sea of grass." As the families in the schooners made their way toward the West the distances between the watering places grew longer, and when they reached the great desert expanses they asked anyone they met, "How far is it to water?" They had to know. Their lives depended on it. The bleached white bones along the trail reminded them that others had miscalculated.

To most of these pioneers distance was no more than a challenge. They had come far for new land and had staked their future on it. With water, they believed that they could make even the desert bloom. So there were those who took up homesteads where only such plants as cactus and sagebrush seemed to grow, but they saw good soil beneath—soil that promised to respond with abundant crops if irrigated.

The U. S. Government began to take an interest in the special problems of the dry regions as long ago as 1877, when the Desert Land Act became law. It required that settlers irrigate their land. But it was soon learned that this cost too much. The result was that most of the land that could be fruitful only by irrigation gradually passed into the hands of large interests. The hopeful prairie schooner people traveled on. Still they encountered the need for irrigation. It was not until 1902 that the Government, under the Reclamation Act, began to help the settlers with their irrigation difficulties.

Since then the work to bring water to the land has been steadily expanded, intensified, speeded up with improved mechanical facilities, and made more economical. Each plan of the engineers has centered around a dam. They had to find spots where the stream was narrow enough to be practical for damming, with space above the dam for a lake of impounded water. The Grand Coulee, Elephant Butte, Hoover, Roosevelt and other great irrigation dams have these requirements.

Nature has limited the number of good dam sites. These are the

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product of millions of years of geological upheavals, bulldozing of glaciers, the stone-cutting action of fast waters. Our engineers have selected the cream of nature's crop of such dam sites. If they are ruined by our neglect, our country will have lost some of the most precious of our natural wealth. The cost of such loss is beyond imagination. The great dams and their irrigation systems make possible the production of food that many millions of our people need; these dams provide electric power for networks of industry. Compared with what they do, their initial and maintenance costs are small indeed.

Yet we have already lost through neglect the best sites on some of our smaller streams. It is of great importance to the generations of the future that there be no more of this. Even dams already in place have been ruined or badly impaired by silt. Prevention of further destruction of one of our most vital resources—water for the land and water to generate power for turning the wheels of industry—is an undertaking of the Department of Agriculture in the field of reclamation.

The planners in this service look first to the region above the dam, where the run-off of the water starts. The forests receive close attention. We serve as trustees of the national forests, which make up more than 137 million acres in the West and provide a great deal of irrigation water in wide-spread areas where it is indispensable to the wealth of agriculture that has been developed in these irrigated regions. We seek to improve the timber, to protect it against fire, insects and disease, knowing well that the national forests are highly effective conservators of the water from the skies. On the forest range lands we regulate grazing for the best use and not over-use of the annual growth of forage. Watershed management is a basic part of our national forest administration.

The importance of doing as much as possible to protect the watersheds is illustrated by what happened to Germany during the war. The Germans are naturally good husbandmen. Before the war they kept their hills well forested and sacrificed their forests only slightly to war needs. But in Berlin last July I was told that when the Russians entered Eastern Germany they cut the timber from the hills, leaving them almost bare. It is said that streams that were always clear are now running red with silt. I mention the matter to emphasize the importance of forest conservation. Also essential, of course, are measures to conserve water not only in the forests but also on the farm and range lands above the dams.

In this work the Department

of Agriculture cooperates directly with farmers and ranchers as individuals and with the soil conservation districts they set up. The cooperation is mutual. Almost all the farmers and ranchers in the West lend a hand. In 1945, for example, ranchers carried out good land management practices on 81 million acres of grazing land. The nine hundred districts in seventeen western States embrace more than 500 million acres of farm and ranch land, and on this great acreage watershed protection and flood control are, of course, a big part of the work.

An important concern of the Department of Agriculture in connection with the dam is power development, which is a special problem in areas where little or no fuel for power generation is available. We administer a program of rural electrification; one of the most appreciated Government services the country has ever had. We look to electric power as a great aid in helping low-income farm families to get on their feet and in protecting the income of all farm families. The dam, the water it impounds and controls, and the electric power it generates, are wonderful assets for the agriculture of the West and of the nation.

In the naturally arid valleys below the western dams the primary value of the dams lies in their readiness with dependable supplies of irrigation water, the lifeblood of crop production in these regions. Farmers here may obtain financial aid through the agricultural conservation service in their efforts to improve their irrigation setups and practices. Many thousands of farmers have been helped in minimizing erosion, leaching and seepage, in the installation of adequate drainage systems and in numerous ways for making the best use of their irrigation water. The accomplishments have been astonishing in the nine hundred districts in seventeen western States.

Technical assistance through the Soil Conservation Service is a big factor in increasing financial returns from irrigation farming. In this type of farming the most serious single hazard is an accumulation of excessive amounts of salt in the soil. In a few years a prosperous farm community can be utterly ruined by salt accumulations in previously fertile soils. As we become more and more dependent upon irrigation agriculture, we more and more urgently need means to combat this creeping paralysis.

Variations in soils, climate, crops, topography and water sources naturally make irrigation requirements different in different localities. In some areas leaching, erosion and waterlogging are especially troublesome problems which receive the constant atten-

tion of our soil conservation specialists in their work to determine water requirements and effective measures for its most advantageous utilization.

These acitvities and the storehouse of information back of them are important to the farmers on all irrigated lands, regardless of where the water comes from. Such work was started by the Department a long time ago in response to calls for aid from the developers of private irrigation projects. That's all there was to it for many years, and privately developed areas still make up sixteen to eighteen million acres out of our total of twenty to twenty-two million acres of irrigated lands. Four million acres are entirely or partly irrigated with water from Federal reclamation projects.

Right now the development of the western water resources is advancing by leaps and bounds. For this high credit must go to the Bureau of Reclamation and to congressional leaders of the past. We are inspired and even somewhat awed by the magnitude of the Bureau's plans for storing the precious waters of our western mountains behind towering dams, so that arid lands can be awakened to life and maintained for great agricultural production and so that electric power may be generated for western industries.

I pay sincere tribute to the notable organization which is advancing this vitally important work. Its past, present and prospective achievements for agriculture in the United States have inestimable value.

Twenty-three hundred years ago the Greek XENOPHON said, "When agriculture flourishes, all other pursuits are in full vigor; but when the ground is forced to lie barren, other occupations are almost stopped, as well by land as by sea."

Soil and Human Health

Condensed from Pennsylvania Game News

Russell M. Wilder, M.D.

Head of the Department of Medicine, Mayo Foundation, senior consultant in medicine, Mayo Clinic, and wartime chairman of the Board of Food and Nutrition of the National Research Council

THE ravages of soil erosion and the depletion of the fertility of the land which result from over-emphasis on money crops of corn, tobacco, cotton and the like have long been recognized. Washington and Jefferson in their day foresaw the ill effects of it. The accuracy of their predictions is now in tragic evidence, not only on the eastern seaboard but in many other regions. Plantations formerly rich are now depleted and forlorn. The people remaining on parts of this land are among the most badly nourished in our country, making them ready victims not only to pellagra but to disease of every kind. There is good reason to believe that the laziness and shiftlessness of the poor of many rural regions can be laid at the door of malnutrition, that a vicious circle has existed—poor land, poor food, indifference, resulting in failure to care for the land, and ever poorer land.

Human erosion follows soil erosion and leads to still more neglect of the soil. Classic examples are the formerly rich regions of the ancient world. Asia Minor at the opening of the Christian era supported a population many times as large and infinitely more vigorous than the sickly peoples which now inhabit it. The one-time fertile plains of northern Africa, where mighty Carthage grew to threaten Rome, are largely waste lands now, with the natives among the more degenerate of the peoples of the world. Greece, Italy and Spain have likewise lost out in the march of time, owing mainly to the poverty of the masses of their people who depend on livings scratched from soils depleted long ago.

In January, 1940, I spent some days in a poor land part of Georgia. In one county was a most distressing situation. The county was so poor the total taxes amounted to only $14,000. The average family income, cash and kind, was $237. The people were listless. Over half the children were skinny and rickety. In the three months preceding my visit no fewer than ten deaths could be

Reprinted by permission from the Pennsylvania Games News, Harrisburg, Penna., December, 1946

attributed by the county doctor to nothing else than famine. The small amount of livestock on the farms was similarly bony and sickly. Several years later I visited another poor land where the people had been grossly underfed for 100 years and more. The principal food crop, so to speak, was fish. Small gardening was done but the total food production was very small. With the money from their fish said to average $140 per year per fisherman, the people purchased other food, mostly flour, fat and sugar, these less expensive foods being all they could afford. The diet thus was very poor and the result what one might anticipate.

The average person was underweight, poor in muscular development, slow in his mental reactions and apathetic. So badly injured was this population that contractors working on defense projects were forced to import labor and to feed the local laborer for weeks and months with a diet especially spiked with vitamins before the man could work an 8-hour day.

Physical examinations of a random sample of this population, some 900 persons in all, revealed much evidence of nutritional deficiency, namely signs of lack of several vitamins in the majority of the people. Time did not permit recording symptoms, but unsolicited complaints were numerous. Vague stomach pains, flatulence and constipation seemed almost universal, as were heart consciousness, fatigue and nervousness.

These examples of the effect of poor land on the public health are illustrative of what may be expected the world over unless the campaigns of the United States Soil Conservation Service and those projected by the Food and Agriculture Organizations of the United Nations receive the vigorous support they ought to have. The lag between acquiring and applying knowledge, always enormous, cannot be afforded in this instance.

Almost all man's foods have come from plants. The plants are used directly or are fed to animals or poultry for conversion into milk or meat or eggs. The most conspicuous examples of the ill-effects of poor soil on nutrition are provided on the farm. Certain diseases of cattle, once mysterious, have been shown to result from deficiency of phosphorus in the soil and consequently in the feed crops. Soft bones result, and stiff and swollen joints. The animals are poor, especially the cows and young stock, and many die. A soil deficiency of calcium has similar results. Soils deficient in iron are prevalent in some parts of this country, most notably in Florida and Georgia, and in regions so affected, anemia is almost universal both in the livestock and the

people. In the Great Lakes area, where the soil is poor in iodine, goiter is a common malady. Besides these elements, calcium, phosphorus, iron and iodine, other minerals exist in soil and lack of them may also cause disturbances. The leaching out of minerals accounts for the poverty of much land.

The humus content of the soil is of great importance. In this humus are the microorganisms of the soil: bacteria, protozoa, fungi. The bacteria play important parts in making the nitrogen of the atmosphere available to the plant. The fungi are said to surround and even penetrate the root cells of the plant, forming what has been described as a living fungus bridge connecting soil and sap, and quite probably supplying vitamins to the plant. A study of the riboflavin content of soils showed correlation of this vitamain with the amount of humus. Some plants take up this vitamin from this source just as they absorb the minerals they require.

Both soil and water erosion are especially injurious to the humus of the soil. This is the top soil that goes first. Also overgrazing and overcropping permit little opportunity for regeneration of the humus. The practice of mining the fertility of our farms by removing yearly some part of nature's heritage which cannot be restored by known chemical means must assuredly be regarded with concern.

It is at this point that planning for food management ties in with conservation of the soil. The basic reason for food management as proposed by the United Nations Food and Agriculture Organization is to improve the nutrition of the people. This involves a shift in dietary practices, encouragement of smaller consumptions of cheaper foods such as flour, sugar, corn and fat, and provision of more of what are called "protective foods." The word "protective" as used conventionally applies to the protection of the consumer. I submit, however, that these foods also are protective of the land and the producer. The land is damaged least, and incidentally the security of the farmer is advanced, by cultivation of protective foods.

What are these protective foods? Briefly stated they are foods that are most nourishing—quality foods if you wish—consumed at present too exclusively by the "quality," unavailable heretofore in adequate amount to the poor. The trouble down South resulted from a lack of them; the major explanation for the condition of the people of the other poor land I described was the same. Both these situations were extreme, but in the country as a whole, when food consumption surveys were undertaken in

1936 and 1942, diets rated good, on the basis of the nutritional contributions of the foods consumed, numbered about 1 in 4—25 per cent. Many other diets were "fair" but some 30 per cent of them were "poor."

Heading the list of the protective foods are milk, cheese, meat, poultry, fish and eggs. Next come certain vegetables, notably peas and beans, and leafy green and yellow vegetables. Next come white potatoes, and in a special category because of their content of vitamin C come several fruits, especially the citrus fruits. What I said about these foods being most nourishing should be qualified to this extent. No one food is completely nourishing in the sense that it provides all the necessary nutrients in optimal amounts. However, these protective foods do a better job than others, and a diet which is liberal in them is more likely to be good than one in which too many of the calories come mostly from sugar, grain and fat.

From the standpoint of protection of the land it is recognized that livestock cultured either for milk or meat returns to the land in natural manure a large measure of the nutrients they abstract from it. The natural manures supply something to the soil which is not obtainable from artificial fertilizers. Likewise vegetables, particularly the legumes such as beans and peas, add nitrogen to the soil and perhaps contribute other factors through their mycorrhizal associations. Garden crops and orchards take relatively little from the land, because to grow good garden vegetables fertilizer must be used and this adds value to the land.

Finally, from the standpoint of agricultural economy and the security of the farmer, there is much to be said against the one-crop type of farming, be this wheat, corn, sugar beets, cotton or tobacco, and much to be said for mixed rotational farming and the self-sufficiency of the farmer who is raising livestock as well as grain and has a garden and an orchard. For many decades we have witnessed the crippling effect of surpluses. Millions have hungered while food went to waste and producers lost their farms. In its most aggravated form these surpluses have attended periods of depression. However, even in prosperity the amount of grain which is within the capacity of this country to produce far exceeds the amount the country can consume.

This is fortunate at present because of the world-wide food emergency, but the time will come again when grain exports cannot be maintained. As has been pointed out by many, the surest way to readjust our agriculture to avoid disaster in the

future from such surpluses is to turn to more production of protective foods. There is a rigid limit to the number of calories, that is, to the amount of food that anyone can consume. There is no such narrow limit, given suitable rearrangement of national purchasing power, to the market for protective foods. War prosperity has temporarily released the economic breaks on consumption of these foods by the poorer members of society, with results apparent everywhere. Excluding exports we have had for distribution in this country much more milk than we ever used before, more meat, more eggs, more vegetables, more citrus fruits. Where are they? The apparent shortages are explained by the larger market here at home, more people able to consume them because of wider distribution of purchasing power. And the result to judge from latest health statistics, has been a stronger, healthier population.

In other words, and in summary, the programs of food management as recommended in the conferences of the United Nations Food and Agriculture Organization, policies based on nutritional considerations, are consistent not only with raising the level of human health but with better, safer farming and more effective conservation of land.

***Clean Gutters.*—A plastic screening can be used to keep roof gutters clean of twigs. leaves and other trash. A narrow strip of screening is inserted under a row of roof shingles and the other edge fastened with aluminum clips to the bead of the metal gutter. This covering screens out trash and permits water to drain into downspout. (Lumite Division, Chicopee Manufacturing Corp.)**

—Capper's Farmer

Those New Hogs! The Minnesotas

Condensed from The Farmer

W. T. Foley

TWENTY-FOUR years ago (in 1924) the late Andrew Boss conceived an experimental project at the University of Minnesota that may eventually pay off in greatly improving the quality of pork and increasing the profit from hog raising.

Already out of this project have come hogs that have made 100 pounds of gain on as little as 300 pounds of feed (about 4½ bushels of corn and 45 pounds of protein concentrate) and that dress out as high as 69% with carcasses that contain a high percentage of desirable lean cuts and a low percentage of fat. This rate of feed consumption is considerably under the average. Considering the world's growth of population and that at present, for the first time in our history, we are short of meat because of limited feed supplies, this factor of low feed consumption is one of great importance.

Because 1947 was the first year in which enough of the inbreds were crossed to produce a significant number of market hogs, the time has arrived when it appears safe to draw some preliminary conclusions at least. Andrew Boss did not know precisely where he was going when he set up his experiment in 1924. He wanted to find out what would happen if certain lines or families of pigs were inbred for a period of years, and then the inbreds crossed. Doubtless he got his inspiration from the development of hybrid corn. He had seen the great increase in yield and quality of corn and he wondered if the same thing couldn't be done with animals. Hogs were chosen because of the fast turn-over and the large numbers available for selection.

The breeding work was begun at the Southeast Minnesota Experiment Station at Waseca under R. E. Hodgson, superintendent. To begin with, purebred Poland China hogs were used exclusively in the experiment.

In 1937 the Department of Agriculture began supplying funds and personnel to various state experiment stations, including Minnesota, to carry on the experimental breeding work. With 13 years of work already behind them, the Minnesota workers had a long start in developing lines to work with. In 1928 Dr. Laurence M. Winters,

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who was born and reared on a farm in Wabasha County, Minnesota, came to the University as professor of animal breeding. Dr. Winters had specialized in the study of animal breeding, a science technically known as genetics. His first work at the University was in crossbreeding with the established breeds. Later he was put in charge of the inbreeding work.

Also in 1937 a new project or sideline was injected into the work. Breeding a Danish Landrace boar, supplied by the USDA, to a Tamworth sow and continuing to breed within that line until the family had become about 40% inbred, the now famous Minnesota No. 1 hog emerged, and is now in commercial production and a recognized new breed of hogs. Landrace and Tamworth hogs were used because both are of the so-called "bacon" type and distinguished for large litters and good nursing ability of the sows.

Another line, which will probably take its place as a new breed, is the Minnesota No. 2. This line was started from a cross of two inbred Poland China lines with a Yorkshire imported from Canada. Again there is the emphasis on lean hogs of the bacon type. The No. 2 has not yet progressed as far as the No. 1, but it is very promising. The early development of these two lines was possible because of the many years of inbreeding work carried on at Minnesota. The 1's and 2's have already been crossed experimentally with other inbred lines with significant results as shown from the accompanying tables of killing percentages, feed consumption and marketing weights.

The duration of the experiment is still unlimited and the end results not yet entirely clear. However, enough crossbred hogs were produced in 1947 to indicate that results of great importance have already been realized.

Most significant is the fact that in 12 crosses ages at 200 pounds varied from 149 days (4 months and 29 days) to 172 days (5 months and 22 days). It used to be considered that 200 pounds at six months was most unusual. Feed consumption for 100 pounds gain varied from 303 pounds to 352 pounds. Some of the better commercial hog growers are able to do it on 450 pounds. At that, Dr. Winters says 1947 feed consumption figures ran higher than usual or expected. He ascribes this to possible poorer quality of feed in 1947.

Most of the better breeders of purebred swine and some of the commercial growers keep records of litter numbers and they mark their sows and litters so that when the time comes to select the next year's breeding stock they have some information upon which to go. Some also weigh litters at

birth and again at weaning time as a means of judging the efficiency of sows in producing and nursing litters. This is called sow testing. The majority of commercial hog growers, however, just go into the lot and pick out the gilts that look best to them.

In the University experimental work described here records are relied upon almost entirely in selections for future breeding work. The records show sire and dam; size of litter; weight at birth and weaning; feed consumption; age at 200 lbs. attained weight; and finally the killing data.

The first step in selection of breeding stock in the University project is careful analysis of the available records. Stock that measures up to standards is noted from the records. Then with book in hand the most efficient "doers" are sought in the lots. If they do not measure up on visual inspection, as many of them have not over the years, they are discarded.

Necessarily, inbreeding produces runts, sterility and a host of other defects. Also inbreeding emphasizes good characters. The reason for this is that either good or bad characters brought together when closely related animals are mated are almost certain to show more plainly in the offspring than they did in their parents. Ability to produce and suckle large litters, efficiency of food utilization, and such other factors, as production of a higher percentage of lean meat, are all inherited characters. Therefore, detail records in assaying these characters are important.

What does this all mean to farmers generally? Already in the utilization of Minnesota No. 1 hogs they are commencing to realize some of the fruits of the dreams of Andrew Boss. As the years go on and more of these inbred hogs are released for farm use, a possibility is a complete revolution in the type of hogs that will be raised on farms. Other experiment stations are doing the same work.

There would hardly be a dependable variety of corn or small grain in the country today if it were not for the plant breeding work of the agricultural experiment stations. By crossing one variety of grain with another in order to combine the good qualities of both or to subdue a bad quality in one parent, such as susceptibility to rust in a wheat variety, a few plants may mature seed in a season. The seed is planted the succeeding year and thus increased from year to year. When enough seed has been accumulated it is put out with selected farmer growers and thus a new variety gets into general use.

Applying this same technique

to livestock, the rate of progress is much slower than with plants, but the principle is the same and in the long run the results should be similar. It would, perhaps, not be too bold to predict that in another 20 years 90% more of Minnesota farmers (as was the case with hybrid corn) will be raising crossbred hogs resulting from the Boss-inspired and the Winters-controlled experiment. But there it is and you can form your own judgment. Certain it is that farmers will be compelled by force of circumstances to adopt a type of hog that will produce less lard and more lean meat. Dr. Winters has constantly pointed in that direction and the new type of hog will surely be ready when farmers call for it.

Domesticating The Animal

Many wild animals quickly lose much of their fear of man in game refuges, and presumably, the initial steps toward the domestication of wild animals were taken largely through the widespread practice of making pets of captured young or crippled wild animals.

Some possibilities for domestication may still exist, although no important species have come completely from the wild to be domesticated within historic times. Perhaps fur-bearing animals, such as the mink and foxes raised in captivity, are now being domesticated in the same slow way as cattle and sheep were many thousands of years ago.

Swine were domesticated early in the Neolithic age in several different regions. (The Neolithic era began in western Europe about 10,000 B. C., being introduced from the east, and continued for about 7,000 years.)

The dog is supposed to have been domesticated in Europe as far back as 10,000 years ago. Cattle and sheep were already important domestic animals in Europe in the Neolithic era, and the suddenness of their appearance suggests they were brought into Europe by people from the east. Horses first appeared on the historic scene as domesticated wild animals around 3000 B. C. Cats were domesticated in or near Egypt not much longer ago than 1000 B. C., and chickens were domesticated in southeastern Asia, perhaps as recently as 1500 B. C.

The only animals domesticated in the Americas were the llama, alpaca, guinea pig and turkey.

—*Sheep and Goat Raiser*

Shy Breeding Can Be Inherited

Condensed from The American Dairy Cattle Club Herd Builder

C. W. Howe

WHEN that cow of yours won't settle, the trouble may come from nutrition, disease, or from glands that are misbehaving.

But there's another angle to this shy-breeding problem that may be important—maybe more important than a lot of us realize. I'm referring here to the inheritance of shy breeding in various cow families and how it shows up in later generations.

Shy Breeding Tends to Eliminate Itself. You can talk with breeders all over the country and most of them will tell you they believe that at least a small part of their infertility problems is inherited—just how much, they don't know. The same would be true on average farms, but the purebred breeders have more complete records.

Many will argue that a shy-breeding family of cows will run itself out. There's quite a bit of truth to this. Sometimes, however, it looks as tho these little things called genes, which carry the characteristics from one generation to another, don't line up so as to make an animal completely sterile. Cows may be inclined toward infertility but still have a few calves. Then the trouble will bob up later in some of their offspring.

Breeding History of One Family. Here is the history of a family of cows I have followed closely. The first cow was bred 10 times before having a calf. Then she was bred 10 more times without success and finally sold. The veterinarian who checked her said she was definitely a shy breeder, and that he could find no mechanical cause for the disease. Her tailhead became high, and she was loose about the pelvic region.

Her one and only offspring, a daughter, did remarkably well, settling after every service. The tendency toward shy breeding, passed on by her mother, must have been completely masked or covered up.

Most of her daughters (granddaughters of first cow) did well, too. But the shy-breeding tendency bobbed up in one. This animal averaged more than 2½ services for each calf. And she would have done worse had the veterinarian not given her close attention. Toward the end, the

Reprinted by permission from the Herd Builder, American Dairy Cattle Club, 134 N. LaSalle Street, Chicago, Ill., September 25, 1947

owner just gave up and sold her as a shy breeder.

Infertility Disappeared for One Generation. This last cow's twin sister did very well as a breeder. As it happens, all of her calves were bulls, and eventually, she was sold off as a low milk producer. However, those facts have no bearing on her efficiency as a breeder.

The daughters of this shy breeder (granddaughter of the first shy breeder) did quite well, so I assume that the character for infertility again was covered up in this fourth generation.

But the tendency toward infertility certainly came to life in the fifth generation. This cow was bred 21 times and settled once. The calf was aborted; but the trouble did not come from Bang's, because the herd tested free from that disease.

With this cow, as with her granddam and great great granddam, the high tailhead and the loose pelvic region became more pronounced as she grew older. In all cases, these cows were so long without calf that they began to look saggy.

What Do Shy Breeders Inherit? Just what cows inherit to make them shy breeders, I can't say. I have asked people who have studied this problem more closely, and they seemed rather hazy. However, they did suggest such things as disease resistance, weakness of the thyroid gland, and lack of sufficient ability to make use of Vitamin A.

There may be many others. For instance, one breeder reported a tendency in his herd for cows to have a double cervix, and this was passed from generation to generation.

I have checked with many breeders as to their experiences and opinions on inheritance of shy breeding. One Guernsey breeder in Maryland had this to say:

"For a number of years I have definitely been convinced, through observation of animals under our care, that the fertility or infertility characteristics are inherited or transmitted through generations, just as much as the characteristics to produce large amounts of milk and high butterfat tests are transmissible.

"We have had numerous cows who failed to breed promptly either for first calf or later on; their daughters did likewise. We also are sure virility of bulls and ability to stand heavy service for long periods of years are inherited."

That infertility tends to run in families is the belief expressed by one Jersey breeder in Minnesota: "I have eliminated at least five cow families from our herd because they did not have as good a conception rate as the other

families in the herd under similar conditions."

Said another breeder: "I remember a cow that gave us only two calves before becoming sterile. We used her son on some of our cows, but he settled only 1 cow out of about every 25 he serviced. One of his daughters gave us only one calf before she became sterile. In the end, all of these cattle were butchered because of their infertility."

Still another reports: "We have had a family of good producing cows in our herd for 22 years. But at no time have we had more than one or two females from that family on hand, because, they would become shy breeders about the time they had one heifer calf. Then the dam would go to market, and eventually her heifer would freshen, and have a heifer, and soon she would go to market, and so on."

The breeders I have asked for opinions do not agree completely on the exact effect of inbreeding and line breeding on infertility, but I will tell you what a few of them said. Here's one, for instance:

"I think that inbreeding can influence conception rate of cattle. If you compare the inbreeding records of the average grade herd with the highly developed purebred herds, you are sure to find that the more highly intensified the breeding, the lower the degree of conception you can expect.

"Of course, with the grade breeder, he eliminates those that give him any trouble, and in that way, if there is any hereditary tendency, he does not carry it along to future generations of his cattle. But with the purebred breeders it's different. They do not want to break up a good cow family and they try by every means to get the cow with calf."

Another livestock man put it this way: "Certainly, line breeding or inbreeding tends to bring defects as well as good qualities of individuals to the surface. If we are going on the assumption that difficult breeding is a hereditary characteristic, we must logically assume that line breeding will locate it so it can be seen."

Now let's turn to a few college and state experiment station authorities. The New Jersey station has studied this inheritance matter for 16 years. While data aren't yet in shape to present, they report that they have found a certain amount of inheritance of "lack of fertility" in some bulls and cow families. They have discovered in their breeding experiments that retained afterbirth has varied all the way from 0 to 30 per cent among 21 cow families.

Says Dr. J. W. Bartlett, New Jersey Experiment Station research specialist:

"It is true that inbreeding may

bring about a concentration of genes that will result in sterility. This is not true of all cow families, however, as our records show.

"I do not believe that one can say that close inbreeding produces infertility because certain genes become dominant on inbreeding. It is a result of piling up of certain genes which relate to fertility; or through inbreeding we may change the relationship of certain genes, thus bringing about the condition."

Dr. V. A. Rice, an authority on breeding, at Massachusetts State College, says:

"It (inbreeding) might result in a concentration of genes that will result in sterility. On the other hand, it might result in a concentration of genes that would stimulate greatly increased fertility.

"It all depends, of course, on the genes one starts with. There is nothing about any system of breeding that induces new genes. They simply put the original ones together into new packages."

Dr. Jay L. Lush, noted Iowa authority on inheritance matters, expresses this belief: "Generally speaking, inherited differences play a minor part in such irregularities (meaning shy breeding), altho undoubtedly they do occur. The fact that they do play a minor part does not mean that they should be neglected. But it does mean that in most cases the major troubles will be in some sort of infection, malnutrition, or management, and that it is usually profitable to look for those things first and hardest."

Experimental findings dealing with inheritance and its effect on shy breeding are not too plentiful. However, there seems to be quite a stir in the field at the present time for more research projects to be set up. New Jersey, Oregon, California and Nebraska are four of the states where this matter has been dealt with to some extent.

At Oregon, they have studied the problem for more than 25 years, and have used some 368 animals, representing four major dairy breeds. One cow family has shown a reproductive efficiency of 85 percent, which means that cows in this family would drop a calf every 14 months on the average. Another family had reproductive efficiency of only 54 percent, which under practical dairy operations means that these cows would calve once every 22 months. These studies present strong evidence that breeding efficiency of foundation cows shows up rather strongly in their descendants. In a study of several large dairy herds in the state, Oregon workers noted that cows with the greatest number of offspring bred more regularly, usually dropped vigorous calves, and bred to an older age.

The research workers con-

cluded, too, that a good share of the infertility in some herds is due to breeding for quality, such as high milk production, without sufficient regard for the fertility aspect. They advise cattle breeders, when looking for foundation cows or herd replacements, to beware of those lines which have inherited low fertility.

Now then, just what can the average dairy farmer do about this? You depend for a living on what your cows put in the milk pail. Your herd may consist of grade cows, so you won't have a lot of breeding data like the pure-bred breeder. If you go after rather high-priced stuff, whether it be a bull, a foundation cow, or a replacement heifer, you can probably get some of your data from the records of the breeder from whom you buy. On the other hand, if you buy somewhat lower-priced animals, you should at least get them from herds where cow-testing association records are kept. The number of services to settle each cow won't show up on these records, but you can tell how far apart the freshening dates happen to fall. That should give you a pretty good idea of how regular the animal may be.

If you are after a bull, you can check the dam, granddam, and maybe some of his sisters for the same thing. It's a cinch that cows with freshening dates too far apart aren't very good bets, unless they have been deliberately spaced that way for some reason.

One bit of evidence against this method of choosing an animal comes from eight years of study of artificially bred cows at the Nebraska Agricultural Experiment Station. They concluded that it was not possible to predict the breeding efficiency of daughters from the breeding records of their dams. However, they found, when the services required per conception were added up, that 1 family out of 20 observed had very low fertility. Two families had extremely high fertility.

In discussing inheritance and how it affects fertility of cattle, my belief has been strengthened that there must be some connection between the two. Another conviction that has grown with the gathering of these data is that far more experimental work needs to be done along this line. In fact, there seems to be quite a movement afoot right now in that direction.

From Pygmy to Giant

Condensed from American Agriculturist

L. E. Weaver

A QUARTER of a century ago, poultry was truly an infant industry. "Mammoth" incubators had but recently evolved from small lamp machines. A few hatcheries had been established in the Mid-west. Commercial flocks of a few hundred hens were no longer uncommon. A 300-egg hen had astounded the public with her unheard-of record. But the infant was having a terrible time. Death in chick flocks was staggering.

"Buy three chicks for every pullet you want to raise," was an accepted rule. "One will be a rooster and one will die, leaving one pullet." The questions, what to feed and how to feed, took up most of the time at poultry meetings. Nearly everyone used "home-mixed" mashes—if they used a mash at all. Extension men warned against "commercial feeds" that "probably were full of oat hulls and other trash."

Storage eggs were in disrepute. Housewives bought even "fresh" eggs with suspicion and hesitation, and in small lots. Most veterinarians scorned the puny poultry practice, even prided themselves on their ignorance of poultry diseases. In fact, the poultry industry was full of growing pains and was struggling to grow up through its period of adolescence.

Today the infant has become a small giant. It is a two billion dollar industry. In our Northeast, only the cow outranks the hen in the value of her contributions. Many factors have contributed to the growth of the industry—improved egg quality, better feeds, great advances in control of disease, scientific breeding, better and more efficient housing, mechanical equipment. Back of all these have been many men with many ideas, research upon research, long hours of labor, disappointments, patience and courage. Let us examine some of these factors more closely.

Last year in this country, eggs were used at the rate of 380 for every man, woman and child. Twenty-five years ago housewives would not have dared to buy eggs in such quantities. Too many would have been "bad." Today eggs are moved to market quickly, protected against heat and dryness. National grading standards, state egg laws, improved storage facilities and wide-spread knowl-

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edge about proper care of eggs have made it possible for housewives to buy them with confidence. The result is a constantly increasing demand for one of nature's finest foods.

Where have all the additional eggs come from? Mostly from farms with a few hundred hens, but also from commercial egg farms keeping thousands of layers. Many more hens are kept than 25 years ago, and they lay a lot more eggs per hen. The jump has been from 89 eggs per hen in 1924 to 118 in 1945 according to the U. S. D. A. This is for the U. S. as a whole. For the Northeast the figures are considerably better.

Most of the improvement has taken place in the past 10 years, and is due largely to better feeding and better breeding. Out of the advancing science of genetics comes the "progeny test" which is chiefly responsible for the great improvement made in egg-laying ability. Mention should be made also of Egg Laying Contests. Only the Storrs contest and perhaps one or two other contests existed a quarter of a century ago. Now there are about 15. The stimulation that laying tests have given to better breeding has been a real contribution, and more recently the National Poultry Improvement Plan has aided in the rapid distribution of improved stock.

In the past 25 years more research has been devoted to what to feed and how much to feed than to all other phases of poultry husbandry put together. "Vitamin" was a brand new word 25 years ago. We couldn't grow chicks indoors, and to get winter eggs was a great effort. Succulent green feed was a necessity. We worried about "over feeding" and were satisfied with a 50% rate of production. The relation of loss of yellow pigment to egg laying had just been discovered and the era of culling campaigns was beginning. All of which is hard to realize in these days when commercial feeds are used by practically everyone, egg production of 75 or 80 per cent is common, hen-housed flock averages often reach 200 eggs per layer, and we talk of "complete" rather than "balanced" rations, and of "full" feeding.

Our most destructive poultry disease of today, Leukosis, was practically unknown 25 years ago, yet laying flock losses due to disease were about the same and chick losses far greater than today. Pullorum disease was "bowel trouble" in those days. It wiped out chicks by entire flocks. Fowl pox and infectious tracheitis killed off many laying hens. We were just beginning to hear of cannibalism. Control measures that are generally effective have now been worked out for all of these troubles and today when

flock owners make use of the blood test, vaccination and debeaking, losses are practically nothing from them. Sulfur, sulfa drugs and sanitation have brought Coccidiosis under control. But in spite of a tremendous amount of research the Leukosis complex still has us baffled.

Twenty-five years ago poultry was kept in small flocks in shallow, single-story, open-front, frigid or torrid houses. No thought was given to saving labor by keeping larger flocks in larger houses. That would have been impossible because direct sunlight through open fronts was the hens' only source of Vitamin D. Cod liver oil in poultry feeds changed all that. Houses have been deepened and insulated, windows closed. They are kept dry and comfortable for hens and man by improved ventilation facilities and that great invention—built-up litter and lime. Feed elevators, laying rooms, nonfreezing water systems and large pens permit one man to care for three or four thousand hens today, but 25 years ago a few hundred was a one-man job.

Mechanized poultry keeping has arrived. Electricity has become indispensable. It lights the layers, heats brooders, pumps water, runs the egg grader, the egg cleaner and the mechanized picker. Metal feeders and waterers have taken the place of wooden ones to a great extent. Forced-draft electric incubators run to capacities of 40,000 eggs. Twenty-five years ago there were no electric incubators and the forced draft idea was brand new.

Until a few years ago the meat end of poultry keeping was sadly neglected. To a large extent that is still true. However, in the famous Delmarva region someone discovered a few years ago that he could make more money growing broilers in his long, shed-roof laying house than by producing eggs. Soon every laying house for miles around had been converted into a broiler house, and hundreds of new ones had been built. Now Delmarva alone could probably grow 150 million broilers a year, but other intensive broiler areas have grown up—Shenandoah Valley, Georgia, Arkansas, and large broiler plants are scattered throughout the country.

This new "industry within an industry" is experiencing its own growing pains. Perhaps it, too, must become the object of research by geneticists, nutritionists, engineers, veterinarians, marketing experts, and economists before our poultry meat will rank with eggs in importance.

We Can Grow Legumes on Acid Soils

Condensed from Hoard's Dairyman

Wm. A. Albrecht
University of Missouri

LEGUMES are almost an indispensable forage for the dairy man. They are high producers of his raw proteins, or the amino acids from which his cows produce the milk proteins. Legumes can use, both from the soil humus and from the atmosphere, the nitrogen that characterizes the chemical composition of these life-carrying substances. But unfortunately legumes are feed crops not grown as universally as they should be. We have often ascribed their failure to the acidity of the soil. Whether this diagnosis of the trouble is correct may be questioned. It deserves reconsideration in the light of our better understanding of the soil and its interactions with the plants.

Acidity is a common soil condition in many parts of the temperate zone. It occurs where the rainfall gives water enough to go down through and to wash out much of the fertility. In general, if the rainfall is high enough to provide plenty of water during the crop-growing season, there will also be enough water to leach the soil of much of its supply of nutrients and to make it acid.

Timbered soils of the eastern United States are acid. Those of the eastern edge of the prairie are also sour. Acidity is a natural condition where soils have had rainfall going down through them and where they have been growing much vegetation. Such soils have, therefore, been subjected to a leaching force taking the fertility downward, and to a competitive force of the vegetation with its roots taking the nutrients upward where they are built into organic combinations. Consequently acid soils have distinct surface soil and subsoil horizons in their profiles. They are naturally low in fertility and have been growing mainly carbonaceous or woody vegetation.

Natural soil acidity is in reality, then, mainly a shortage of fertility in terms of many plant nutrients. This is the situation because the soil has been under cropping and leaching for ages. This was true before man took over to intensify these effects. This, then, is the condition of the soil that prompts the common question. How can we grow mineral-rich, fertility-consuming for-

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ages, like the legumes, of good feed values for such a high-powered, protein-producer as the dairy cow?

Applications of limestone and other compounds carrying the nutrient calcium to acid soils are known widely to be beneficial soil treatments for legumes and other crops. This was known even to the Romans who used lime as a fertilizer on their soils. Much later in general, but yet early in our own colonial history, it was reported that Benjamin Franklin used gypsum or land plaster on clover with good improvement of this legume crop. Here right on our own soils the ancient agricultural art of liming the land was practiced for the benefit of better crops as feed. Here the sulfate of lime, or gypsum, which does not take away the acidity of the soil was making better clover. We have forgotten this unusual wisdom about soils among the many bright ideas that came down to us from this colonial sage. We may well go back and look carefully and critically into it now. We need to ask ourselves, "Why can't we grow legumes on acid soils when Franklin grew them better by putting on calcium sulfate?" This was a soil treatment that not only failed to reduce the soil acidity but even made the soil more sour.

It was the growing agricultural science of the early decades of the twentieth century that brought liming of the soil back as a more general agricultural practice. We cannot say that liming was an art carried over from colonial days. It had been pushed out when fertilizers came into use. Liming the soil has become an extensive practice under the encouragement of an embryo soil-testing service. That service was guided by the belief that the applications, (a) of limestone which is a carbonate of calcium, (b) of hydrated lime which is an alkaline calcium hydroxide, or (c) of quicklime, caustic oxide of calcium, are all beneficial for crop growth because each of these is ammunition in the fight against soil acidity, or against the high concentration of hydrogen in the soil.

This struggle to drive the hydrogen ion, or acidity, out of the soil was aided by the technological advancements giving us instruments and equipments that measured the hydrogen ion to a finer degree than known before. The ease and speed with which soil acidity could be detected and measured encouraged the widespread testing of soils. This activity discovered soil acidity almost everywhere. Through the help of the measuring gadgets we were impressed by the apparent universality of soil acidity. Only a few humid soils were not seriously stocked with acid. We discovered that for acid soils, in gen-

eral, the productivity was lower as the degree of acidity was higher. From such a discovery we might expect ourselves to conclude—even though it was later found to be the wrong conclusion—that the presence of the large amount of hydrogen ions in the soil was the cause of the poor crops. This conclusion would be expected also from the bigger troubles in growing the proteinaceous, mineral-rich legumes of higher feeding values.

The extensive use of limestone in the corn belt has now multiplied itself into the millions of tons of these natural rock fragments that are annually mixed through the soil. This increased use was prompted by the beliefs (a) that limestone is beneficial because its carbonate removes the acidity of the soil, and (b) that soil is most productive if it is neutral, or when it has no active hydrogen ions in it. Under these beliefs (now known to be poorly founded) we have become belligerent foes of soil acidity. Limestone has become the ammunition for fighting this enemy hidden in the soil. Under national financial aid we have been prone to believe that in putting limestone on the soil we can follow the old adage which says "If a little is good, more will be better." We are just now coming around to a better understanding of how Nature grew crops on the acid soils before we did. We are now beginning to understand what limestone really does when it makes better crops.

Only recently have we recognized the fallacious reasoning behind the conclusion that it must be the presence of the acidity in the soil that brings the crop failure when liming lessens the soil acidity and makes better crops at the same time. While the convenience of soil testing gadgets encouraged this erroneous belief about soil acidity as an enemy, it was the diligent study of the physiology of the plants, of the colloidal behavior of the clays growing them, and the chemical analyses of all these, that finally pointed out the errors of such hasty conclusions. It pointed out that soil acidity is not detrimental, but is in reality beneficial.

We now know, of course, that in applying the limestone, which is calcium carbonate, there is possibly some reduction of acidity by the carbonate portion. At the same time there is being applied also some calcium—a nutrient highly deficient in the leached soils—to nourish the calcium-starved crops. This nutritional service comes about both directly and indirectly. We have finally learned that it is this better nourishment of the crop rather than any change in the degree of acidity of the soil that gives us the bigger and better crops. Unwit-

tingly we have been fertilizing the crops with calcium while fighting the soil acidity with the carbonate, the hydroxide, or the oxide of lime.

In spite of our ignorance of how the lime functions, we have benefitted by using it. However, an erroneous understanding of what happens to the crop and to the soil when we lime cannot successfully lead us very far into the future. We cannot continue to grow better feeds under the mistaken belief that we do so merely by the removal of the soil acidity through the use of plenty of carbonates on our humid soils. Wise management of the soil to grow nutritious feeds can scarcely be well founded on facts so few and so simple.

Should you decide to demonstrate for yourself the truth of what has been said above, you can apply some soda-lime, or sodium carbonate to the acid soil. This will reduce its acidity. But unfortunately for you if you are a foe of soil acidity, this soil treatment will rout the enemy but will still not give successful crops. Merely removing the acidity by a carbonate (of sodium rather than of calcium, in this case) does not guarantee the crop.

As proof that it is the calcium as plant nourishment that is the helpful factor in liming, one can repeat Benjamin Franklin's demonstration and apply calcium sulfate to the soil. One might even apply some "Dow Flake," a calcium chloride. Either of these calcium-carrying compounds will make the soil more acid. But in spite of this fact and because they add calcium, the gypsum and "Dow Flake" will improve the crops on the initially acid soil left so. We are now resurrecting the ancient art used by Benjamin Franklin for whom liming the soil was a matter of fertilizing it with calcium (and sulfur) and not one of fighting soil acidity.

While we were fighting soil acidity we have failed to notice that most of the populations of the world are concentrated on the acid soils. They are not in the humid tropics where the soils are not acid. Nor are they on the arid soils that are alkaline, a reaction opposite to the acid. Soils that are not acid are not necessarily the supporters of many peoples. Yet in fighting soil acidity we labor under the belief that if a soil were limed to the point of driving out all the acidity, such a soil should be highly productive.

We now know that even while a soil may be holding considerable acidity or hydrogen, it is also holding considerable calcium or lime. To a small extent of its exchange capacity, it is also holding nutrients other than calcium. Among these are potassium, magnesium, manganese, and others. But these in total are held in

much less quantity and by less force than are either the calcium or the hydrogen, the former a nutrient and the latter a non-nutrient. Should we put on lime or calcium enough to drive all the acidity out of the soil by putting calcium in place of the hydrogen, all the other nutrients would be more readily driven out than would this acid-giving element.

Liming the soil heavily, then, does not necessarily drive out only the acidity. Instead it would also drive out all other fertility. It might load the soil with calcium so completely that it could offer only calcium as plant nourishment. Plants would then starve for other nutrients even though on a neutral soil. Plants on such a non-acid but calcium-saturated soil would be starving for all the same nutrients, except calcium, as they do on the acid soils. Making soils neutral by saturating them with calcium does not therefore make them productive. This is the situation of some of the semi-arid soils of our western states. In our struggle against soil acidity we need to remember that neutral soils are not the productive soils. Instead it is the acid but yet fertile ones that feed us and nourish the major portion of the other peoples of the world.

Calcium has been a good fertilizer for legumes on acid soils now for some years. In has been serving directly as a nutrient for the plants. But it has also served indirectly by helping other nutrients get into the plant roots more abundantly. It helps the nitrogen of the acid soil to get into the plant. It helps the phosphorus, the potassium, and other nourishing elements to be taken more readily by the crop. A plant grown for a short time on a lime-rich soil and transplanted to one low in calcium—that is, one that is acid—will take more nutrients from such a soil than will the plant that was starved in its early life for lime. It is because of this behavior of the calcium that a limed soil is soon in need of other nutrients beside the calcium.

We are discovering rapidly that there is need now for postassium on many recently limed but still acid soils. Other soils in similar condition show their serious needs for nitrogen. Lime,of course, may well be the first fertilizer needed. But when once this need is met on these soils that were highly leached long ago, the need for other nutrients may be quickly evident. Perhaps it is these fundamental soil facts that are bringing fertilizers into such prominence in the corn belt today, while only a few years ago limestone was the only soil treatment. Perhaps these are the facts behind the age-old rhyme that told us long ago that "lime and lime with-

out manure, make father rich but son poor."

We now know that instead of saying that acidity has come into our soils we should say the soil fertility has gone out. Legumes which make good feed for milk producing animals must have fertile but yet acid soils from which to make the feed that will be good. Lime is one of the foremost fertilizers in making soils capable of supporting the protein producing crops. For this service to plants, phosphorus is also needed. Then, too, a plant needs potassium to make the carbohydrates from which the proteins can be constructed through the help of these soil-borne nutrients. Not only one element but many nutrient elements are needed. These are taken out of the soil as the plant trades hydrogen as acid for them. Consequently the highly acid soil is simply one that has become deficient in fertility.

We can grow legume crops on acid soils if we will give them calcium and all the other fertilizers needed by the soil to grow them. Red clover was commonly said to be sensitive to acid soils. Yet liming the millions of acres has not restored this crop to those extensive areas. The high cost of its seed is sufficient testimony of the crop's scarcity today. This crop usually needs potassium, or phosphorus, or possibly other fertility elements on a soil deficient to the point of being naturally very acid. Then, too, when a soil is properly fertilized, red clover will grow even if the soil is highly acid. We now know that the soil acidity is not the problem in growing the legumes. The production of these protein producing crops is a matter of ample soil fertility among which the calcium is only one nutrient. If we provide this one by means of limestone and then add all the other necessary fertilizer nutrients for the soil in question, we can grow legumes of highly nutritious values as feed without removing all of the soil acidity. Growing legumes is a matter of feeding these crops, and not a matter of fighting soil acidity.

Soybeans came is as a "new" legume crop. They were reported to "grow in acid soils." But on such soils they were also reported to be "a hay crop and not a seed crop." We did not realize that if they were not building proteins and other complexes demanding soil fertility to make a seed crop and that consequently they could not be a nutritious hay in these respects. Soybeans need lime, too, if they are to give good feed. They are showing growth troubles when the soils are not well supplied with magnesium. They are also reporting the need for manganese on some soils. Soybeans can be grown on an acid soil that is fer-

tile in more respects than in calcium only.

We need no longer hunt for "acid-tolerant" legumes. Any plant that is well nourished tolerates acidity. It causes the soil to become acid when it takes the fertility from it. The root itself is acid and makes the surrounding soil area acid by the carbonic acid it respires. It is this carbonic acid by which the plant carries on the business of taking calcium, potassium, magnesium, phosphorus, iron, and its whole array of nutrients from the soil. It trades hydrogen or acid for them. Acidity is therefore "natural" for any plant.

Growing legumes is not a problem of getting rid of the acidity of the soil. On the soils where we say acidity is a problem, the problem is one of putting in place of the acidity the list of plant nutrients lost excessively from the soil as it becomes acid.

The Law of Correlation

Condensed from The Shorthorn World

Dr. Carl W. Gay
University of Ohio

THE average student who has been trained in livestock judging, as well as the casual observer, often marvels at the prompt and accurate decisions arrived at by commercial cattlemen. After experiencing the detailed study of each animal under consideration, as in the judging arena or the show ring, one may be at a loss to understand how the cattle buyer can make his selections so expeditiously. It is quite apparent that he must be exercising more than mere snap judgment since his decisions will be confirmed if a careful and painstaking check of the buyer's work is made.

Every market day cattle by the carload are selected or rejected by packer or order buyers with a minimum of inspection. Feeder cattle are sorted, carload after carload, via the gate cut, in the same apparently casual manner. One quick glance or a hurried once over is all that is required to determine the nod that indicates into which pen, selects or rejects, a particular individual shall go. And these decisions must be

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accurate because large amounts of money are involved and errors would be too costly to be tolerated. The question is, "How do they do it?" The answer is, "They are aided by the law of correlation."

Of course practice makes perfect and these buyers get a lot of practice but something more than practice is involved. Just as selected samples are truly representative of the whole, so certain features of conformation have a sampling relation or an index value to the animal as a whole. For instance, the buyer of fat cattle may press his thumbs on the pin bones and judge accurately of the finish the beast possesses since, if he is bare anywhere it will be at these points. If the flanks bulge outward, alternately with each movement forward of that hind leg, the steer is reckoned to be fat because flanks, cod and base of tongue are the last places that fat accumulates in the fattening process. If this accumulation is not yet noticeable the fattening process is not completed regardless of the thickness of covering at certain points, and the feeding period should be continued. At least such a steer or heifer would not yield its utmost on the packer's rail. On the other hand, if finish is evidenced by the fullness of flank or cod the end of the line has been reached so far as fattening is concerned, regardless of the existence, possibly, of some bare places, and no further time or feed should be expended in a futile effort to cover such bare spots.

By such a sampling method the evaluation of the whole may be accomplished. And this sampling inspection may be carried to many parts without complicating the system or prolonging the necessary inspection. Certain features, as the relative proportions of the head, constitute an index to the animal's form in general and the correlation is usually very close. In the overall picture there is an inverse correlation between length of the animal on the one hand and its breadth and depth on the other. That is, a short head will be broad, not only apparently but actually, and a short, broad head is associated with short legs, a short, thick neck, broad, compact shoulders, a wide, deep rib and body with broad, deep, full hind quarters and a thick covering of natural flesh throughout. Conversely, a long, narrow, "drink-out-of-a-jug" type of head suggests and is usually followed by a long, lean neck, sharp shoulders, a narrow, shallow body, with light, peaked, hindquarters, and on long legs. It would take a rather minute examination to observe all of these features of type and conformation, one by one, yet they are all covered by a sin-

gle look at the length and breadth of the head.

It is quite obvious that if a cattle beast should stick his head through an open door or window or have a blanket thrown over all but his head, his type would be pretty well established without viewing any more of him. It is this correlation of parts, one with another, that enables the practical judge to cut corners in his observations and it accounts for the comparative rapidity with which he makes correct decisions.

One of the broadest, most general correlations, as well as most important from a feeder or breeder's standpoint, is that of type to production. The question is often asked, "Why is it so essential that a beef animal shall be low set, broad, deep and compact in form?" The answer is that this is the type that is correlated with a wealth of natural flesh and a capacity to use feed most economically and efficiently to produce a high yielding carcass of choice grade. A leggy, long, narrow, shallow-bodied individual will be a hard feeder, a low dresser, and his carcass will lack the form and finish required to make the better grades.

Handling quality refers to the thickness, pliability, and sappiness of the hide, as detected by rolling in the palm of the hand a fold of hide, preferably that over the back rib because it is loose there and is correlated with a fine, smooth bone and superior texture of fleshing as well as general refinement which influences, favorably, dressing percentage.

The lay and luster of the hair tells an important story to the skilled buyer. Mellowness of fleshing may be indicated thus without handling and some experienced cattle buyers even can see in the character of the hair coat evidence that the cattle will kill out red.

Even color may be an index to important features desired by the feeder or packer. White cattle are quite regularly quality cattle and good doers. The dark shades of red are suggestive of a heavy hide while the lighter, even yellow, reds are usually most mellow handlers. Hugh Watson, when he founded the first great herd of Angus at Keillor reported that he selected the "blackest and best." Since the color of early Angus was variable, reds, browns and brindles being described as well as blacks, recognition of the superiority of the blacks is implied in Watson's choice. Of course, color may be effect rather than cause, as in the case of the blue grey or prime Scot. Although cattle of this color have been favored, both by feeders and packers, this preference is more likely due to the fact that they were crossbred Shorthorn-Angus or Shorthorn-

Galloway, the color serving merely to identify the cross.

Recent studies conducted on dairy cattle have demonstrated a very definite correlation between heart girth and body weight of the animal. A specially graduated tapemeasure has been devised by the use of which the weight can be determined approximately, by measuring the heart girth.

No one has a better opportunity to become highly proficient in judging commercial livestock than the packer buyer. Not only does he have access to killing data covering dress and yield but he can inspect personally, the cattle on the rail, checking their form, quality and finish, as well as ultimate grade. By this means he is enabled to corroborate or correct his mental picture of what was under the hides of the cattle he bought.

Even replacement cattle are rated according to the law of correlation. Though they may be very thin and appear drawn and shallow in body, if possessed of the short, broad, wide-muzzled feeder's head with broad, flat back, full heart girth and muscular hind quarters the buyer may be assured that they will finish out, with feed and care, into the beefy forms with which their short, broad heads and wide, flat backs are correlated.

Much more time is allotted to show ring judging than the usual market schedule affords but here even in pure bred classes, the dispatch with which large rings are passed upon is made possible by invoking the law of correlation, in some degree. The same indexes that have been described for commercial cattle, hold and are taken advantage of, as important aids in the selection of breeding cattle.

Another thing that facilitates the work of the experienced buyer or judge and insures him the best opportunity to make fullest use of the law of correlation is a systematic manner of making his observations. By working in an orderly fashion every look and every touch are made to count. By concentrating upon the impressions made by each, the convictions arrived at are definite so that back tracking to reaffirm a certain point, or a vacilating decision from which there is a good chance that the mind will be changed, are avoided.

Stretch Your Fertilizer Dollar

Condensed From Successful Farming

Delmer E. Groves and *Robert E. Yoder*
Ohio Agricultural Experiment Station

TODAY, practically all successful farmers try to maintain a high organic-matter content in their soils by generous use of sod crops, green manures, and the return of barnyard manure or crop residues to the land. Many are finding it profitable to use commercial fertilizer at rates equivalent to 200 pounds or more per acre per year of the crop rotation. They concentrate the applications on either the most responsive crops, or the higher acre-value crops.

In recent years, much attention has been attracted by experiments and field demonstrations involving plowing under fertilizers at heavy rates of 500 to 1,000 or more pounds per acre. Obviously, such heavy rates of fertilization should be expected to increase crop yields materially, no matter where the placement. Results of an experiment continued at the Ohio Agricultural Experiment Station for a third of a century prove this statement.

And nearly maximum yields of all crops were obtained when the fertilizer was divided between the two most responsive crops in the rotation: namely, corn and wheat.

During the last 8 years of the period, 1,000 pounds of 4–12–8 per acre per rotation were divided equally between the corn and the wheat. This produced yield increases of 25 bushels of corn, 12 bushels of oats, 19 bushels of wheat, and over 1 ton of legume-grass hay.

Obviously, the heavy rate of fertilization has been very profitable. The hay crop has averaged 3¼ tons per acre. And corn yields that followed the sod have averaged over 76 bushels per acre, without the application of any manure.

There is much to support the opinion that the response to plow-under fertilizer has been primarily a response to increased nitrogen fertilization. Broadcasting nitrogen before plowing has proved to be as profitable as banding on the furrow bottom. Banding simply does not justify the time, expense, and trouble.

In all cases, the fertilizer response will be regulated by the organic matter and physical condition of the land. Some may feel that heavy plow-down applica-

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tions are needed on poor land. In Ohio experiments, the yield level of a well-drained subsoil was raised from 31 to 86 bushels of corn per acre. This was done by liming to legume level and fertilizing at a rate equivalent to 150 pounds of fertilizer per acre per year.

Four hundred pounds of fertilizer were applied to the small-grain crop in which the legume was seeded, prior to corn. The same fertility treatment and rotation has produced as much as 120 bushels of corn per acre on non-eroded topsoil.

We must remember that yields on Cornbelt soils are tied closely to quantity and quality of legume-contained sod crops in the rotation. There are several reasons for this, one being that this is the point for mobilizing the growth element—nitrogen.

As estimated 240 million tons of nitrogen are removed from Ohio soils annually, while only 15 million tons are returned as commercial fertilizer. Where does the rest come from? If we saved half the available supply of manure, it would put back 50 million tons.

Clearly, the bulk of the nitrogen must come from the legumes in the rotation, if the original soil organic matter or humus is not to be completely removed.

The roots of the sod crop are primary sources of soil organic matter. The approximate dry-weight root residue of common crops in pounds per acre are listed below.

Potatoes	300– 350
Soybeans	500– 600
Wheat	700– 800
Corn	1,000–1,200
Alfalfa	3,000–3,500
Grass sods	4,000–5,500

You can see that the grasses, as well as legumes, are beneficial to the soil. It is the sod crop in the rotation which restores favorable soil physical conditions.

High-yield levels have been maintained by using recommended rates of fertilization and standard placement methods in a high-quality sod rotation. Under such conditions, additional plow-under fertilization has failed to increase yields significantly, provided manure is returned to the land.

Rather than try for sensational yields, try following a few simple, well-established principles of fertilization. High acre-value crops may call for fertilization above the safe rates for row application.

Plowing under fertilizer may be pratical in such cases where a highly intensive row-crop farming program is practical. This should be considered as supplemental to, rather than replacement for, established practices.

Concentrate the fertilizers on the crops in the rotation which

will give the highest response. These will usually be corn, wheat, truck and canning crops, and the older meadows (when it is necessary to carry them over).

Fertilizer left in the soil from previous fertilization will usually be enough for soybeans, oats, and short-lay sod crops. Remember that, tho soybeans show uneven response to direct fertilization, they thrive under conditions of high soil productivity.

Fertilizers are expected to pay for themselves. They may not under the very high rates of application. It is questionable whether it pays to keep an excessively high fertility reserve in the soil—above that ordinarily needed by the crops in the rotation—for they are subject to considerable erosion and leaching.

When you plan the fertilization program on your own farm, remember this. In Ohio tests, with a 4-year rotation and recommended surface rates of fertilization on limed, well-manured land in a high state of productivity, no combination of nitrogen, phosphorus, and potash has given profitable returns for plow-down application.

Recommended surface rates of applications are 150 pounds of fertilizer per acre on hill corn, 300–400 pounds on drilled corn, plus 300–500 pounds per acre on the small-grain crop in which the meadow is seeded. It is very important to fertilize the small-grain crops, in which the "soil-building" sod-crop seeding is made.

On the average Cornbelt farm, this is probably the most important fertilizer application made in the rotation.

Milking Through a Pipe

Condensed from Nebraska Farmer

Jim Boan

WHEN it comes to producing grade A milk much credit is due a grade A milking system. On Marion Condon's farm a mile east of Aurora, Nebraska, the milk is never exposed to barnyard air.

The Holstein cows come from the loafing room into the milking parlor for a few bites of 32 percent concentrates. A pulley control in the parlor opens the door and in walks the cow. There are three milking stalls in the parlor. Each stall has two gates, one to enter and one to leave by. While

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the cow is in the stall both gates are closed, but as soon as she has been milked a lever is pulled, the stall gate opens, a tug at the pulley rope and the exit gate into the loafing shed opens, letting the cow out.

After each cow is milked the teat cups are rinsed for cleanliness and prevention of mastitis. As soon as teat cups are placed on a cow the milk bubbles up in a glass observation bowl in the line toward the milk room. Milk is pulled by a vacuum through the milk lines, a filter type milk clarifier, and into ten-gallon milk cans. A rubber seated cap, with milk and vacuum lines attached, fits snugly into the mouth of the can and is held there by vacuum.

A heating unit in the milk room provides hot water for cleaning pipes, teat cups, and cans. Just before each milking a solution of chlorine is used to sterilize all equipment touched by milk.

The entire dairying system has been built since the spring of 1947, when Mr. Condon moved to the new farm. Actually the system was built around a barn already on the farm. The milk room and milking parlor were added to the west side of the barn. On the north and east a loafing shed was added for the cows.

The cows come into the loafing shed from the feedlot where they are fed corn silage in feed bunks. They don't have time to eat much while they are being milked. The silage comes from a new 36-feet-deep circular silo. The concrete silo was finished last summer, and last fall it took 30 acres of corn to fill it.

The milking system is operated by a two and one-half horsepower gasoline engine now. Mr. Condon hopes to get electricity soon.

Although only three cows are milked at one time, it doesn't take long to milk the entire herd. A Wisconsin dairy specialist timed them one night; the Condons milked 18 cows in 45 minutes.

Mr. Condon belongs to the Hamilton County Dairy Breeders Association and all his cows are bred artificially. All the cows are tested for tuberculosis and Bangs disease, which is a dairy production requirement.

Mr. Condon belongs to the Dairy Herd Improvement Association and has some top producing cows in Hamilton county and the state.

Guzmans' Plan Earns $1.50 a Bird

Condensed from Poultry Tribune

G. T. Klein
University of Massachusetts

SINCE 1908, the Guzmans have demonstrated that a commercial egg farm can pay.

They have worked out mass production methods that save labor and make money. Many of the methods established on this farm long ago are just beginning to attract the attention of commercial egg producers of the industry. They have demonstrated that under their conditions $1.50 a bird can be realized over a period of years as an average profit.

Oakhurst Farm is in Connecticut near Hartford. It was started nearly 40 years ago by Arthur S. Guzman, Sr., his wife, and Elizabeth Mahnken. In 1945, following the death of the father, Arthur, Jr., took his place to operate the farm with his mother and aunt. Art is a graduate in poultry at the University of Connecticut and is a specialist in nutrition.

Three people, with the help of one half-time worker, brood 13,000 pullet chicks a year, care for 10,000 laying hens, and keep the buildings in repair.

From 1908 to 1932 they kept Leghorns to produce white eggs for the Connecticut market. Then a shift was made to heavy breeds. They tried several breeds and crosses, finally settling on the one called the sexed linked. It is the cross of the Barred Rock female and Rhode Island Red male. For several years this has been the only chicken on the farm and there are no thoughts of changing or of even trying another.

The Guzmans have quite a list of reasons why they like this pullet best. It is docile and easy to handle, is not flighty, and does not develop cannibalism easily. Then, too, it is a good layer, has a nice meat carcass, and lays a good brown egg. Sexing is almost 100 percent accurate.

When the Guzmans picked their hatching dates, they selected two days and have held to them. These dates are February 21 and 24. They have 6,500 of the Sexed Linked pullets delivered on each date. This is about right for late summer and fall production and late enough to avoid much of a neck molt.

The chicks come from a large Connecticut hatchery that features this cross. The order of

Reprinted by permission from the Poultry Tribune, Mount Morris, Illinois, February, 1948

13,000 chicks is made up of chicks from 10 different New England supply flocks. This minimizes the danger of the chicks from a single source being off in quality for the year, which sometimes is the case.

The stock is brooded in a thoroughly cleaned and disinfected brooder house. A big iron boiler is mother to the chicks. It's what one would call an old fashioned set-up, with pipes along the north wall and a hover over the pipes. But it works and is economical too. The heating bill last year was less than $60 for coke.

The brooder house is a double decker, 30 feet deep and 280 feet long. There are 15 pens on each floor. Wire partitions separate the broods. The pullets go to range on May 8 at about 45 days old. They are housed August 1 to 15.

The range shelters are 8×10 feet, closed in on three sides with wood. They give good protection to these 8-week-old pullets. The houses can be moved easily with truck or skids and they stand up well under wind storm or hurricane. The shelters have roots but no droppings pits or boards.

The shelters are on a range used in a rotation which calls for moving each third year. The land around the buildings is plowed or cultivated and seeded to grass and cereals each fall. It is thoroughly limed and fertilized. Rolling land and sandy soil are factors in the sanitation and disease control.

Pens in the laying house are large—extremely large. The newest building is 250 feet long and 30 feet deep without a partition. In it are housed the black pullets at the rate of two square feet of floor space per bird. Nests in a single tier extend entirely along the east, north, and west sides.

Roosts are about three feet high and are about six feet from the north wall. They extend the entire length of the building. The roosts do not have droppings pits or boards. The manure falls to the floor and becomes most of the litter for the winter. Of course, the floor gets a light covering of litter at housing time. Heavy feeding of oats gives litter that stays in good condition, so far as dryness is concerned. The pen has a single waterer located in the center of the pen. Litter around this is changed occasionally during the winter.

The flock is fed grain and mash, delivered to the farm weekly. Layers get 3 parts mash, and 2 of scratch in June, although normally it is 50–50. Mash hoppers run dry for a short time before the next feeding. Scratch is fed on the floor, enough to last for two hours. There is a little more restricted feeding on Sundays.

Growing chicks get grain daily, fed on the ground, and mash in

open hoppers filled every second day. Next year the feed company will manufacture pellets, and they will be added to the ration. This year some pullets were started on the new ration formulated by Dr. Harold Scott of the University of Connecticut. It has given such excellent growth that the Guzmans wish they had used it more extensively.

Production in mid-June was running 65 percent for the flock. For the year it is 160 to 190 eggs per hen on the basis of hens housed, a high average. Culling is heavy, going on every day of the year. One floor of the brooder house is filled with layers. These are sold in January to give time for cleaning before brooding. Other birds are sold in the summer, giving the pens a short rest period before new pullets are brought in.

Eggs are graded and packed daily. Dirty eggs are washed with one of the new type cleaning agents in the water. Eggs are drained and cased. Twice a week in summer, and oftener in spring, eggs are sold to the Central Connecticut Egg Cooperative. A special egg room in the basement holds cased eggs at around 50 degrees. Eggs are gathered in pails, because of lower breakage. No eggs are cased until thoroughly cooled.

All outside flock work is done by Art Guzman and his mother, with the help of the part-time worker. They expect to have a full-time worker soon because maintenance of the plant is difficult with present help.

When asked what profit a bird gives under such a set-up, I got the answer of $1.50 a year. This is above costs and plant maintenance. That's an average figure.

This is a well-managed flock. Many suggestions of Roy E. Jones, extension poultryman, University of Connecticut, have entered into the program. Mass production and efficient methods such as are used here look necessary if commercial poultrymen are to exist.

A Complete Farm Plan

Condensed from The Dakota Farmer

John T. Loucks
Conservationist

OFTENTIMES there is considerable confusion in the minds of people when the phrase "A complete farm plan" is used. Does it mean merely a systematic listing of various practices to be used on a farm? Does it mean a pledge to perform some conservation measure? Does it mean a regimented hard and fast rule to follow? It is none of these. It is an important step taken by the individual farmer to better understand his farm, its ability to produce, its needs, and its makeup.

The basic data, the basis for developing any farm plan, lie solely in the land capability survey. The importance of this survey cannot be over-emphasized. The soils, the erosion, the slopes, etc., determine the ability of the land to produce and what it is best suited to do. The soil conservation service has developed a system of land classification whereby every acre is classified according to its ability to produce—and its needs to remain productive over a period of years.

A complete farm plan, as developed by a technician of the U. S. soil conservation service and the farmer, is done on the farm in the field. Together they discuss the possibility of a change in crop rotations, the seeding down of treacherous soil to grass and legumes, the planting of field and farmstead tree belts, or the construction of a stockwater dam in the pasture. Many questions come up for discussion, on every farm, when the two individuals, the farmer and the experienced farm planner, seriously consider the problems involved. To some of the problems there may be no apparent solution. Experience indicates that a plan can usually be worked out on most farms that will meet the need of the farmer and, at the same time, provide adequate conservation measures.

The completed farm plan usually consists of a capability map, a land use map, a plan of operations, and an organization summary. The capability map indicates, by different colors, the exact ability of each acre of land and what class of use it should be in, that is, grass, cropland, trees, etc. The land use map shows the over-all plan of the farm,

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the cultivated cropland, pasture lands, woodland, fences, buildings, roads, etc. The plan of operations shows the land use and treatment for all the land on the farm. The rotations, methods of cultivations, and additional conservation practices are indicated for all the acres. It suggests a crop rotation to be followed, or possibly the type of fertilizer to be used. Likewise it suggests how the pasture and woodland should be handled to give the best returns.

This plan varies from farm to farm and must be adjusted to meet the individual farmer's resources of time, finances, and equipment. A complete farm plan, as developed with the soil conservation district, is an organized way of approaching the increasingly difficult job of farming land in a manner that will permit it to continue to produce for years to come, through good and bad years.

Milk-Borne Diseases

Condensed from Farm and Home Science

Dr. Wayne Binns
Head of Dept. of Veterinary Science

THERE are a number of human diseases which may be transmitted by the medium of milk. There are also a few animal diseases which are infectious to man. To prevent these diseases, all communities should support a program which aims at controlling the health of animals, the sanitation of dairies and milk plants, and the health of dairy employees.

Since milk-borne diseases are for the most part the result of drinking contaminated raw milk, or raw milk from diseased cows, it is obvious that the added safeguard of pasteurization should be superimposed on clean milk from healthy cows.

The important objectives of a milk-sanitation program are the control of the production and processing of milk to such an extent that epidemics of milk-borne diseases will not occur in man, and to improve the keeping qualities of the milk. The microorganisms which are responsible for human diseases may be of two general types: first, those which are primarily of animal origin; second, those which are of human origin, gaining entrance to milk

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supplies by passage to the udder of the cow or by direct contamination of milk and milking equipment.

Some of the milk-borne diseases occur in epidemic form while others do not. The organisms causing epidemics usually are those which undergo some multiplication in the milk. The organisms of typhoid fever, paratyphoid fever, septic sore throat, scarlet fever, gastroenteritis, and diphtheria are typical examples. Undulant fever and tuberculosis are not often found in epidemic form.

Typhoid and Paratyphoid Fever

Typhoid fever is the most common milk-borne disease. Many people remain as immune carriers of the organism after having had the disease. The contamination of water supplies by the discharges from patients sometimes occurs. Milk often becomes contaminated by washing the utensils in water containing the organism or the utensils may be contaminated by the carrier if he is not careful in his personal hygiene. Flies may also carry the organism to the milk and milking utensils. In 1938 an epidemic of typhoid fever in England was reported as caused by cows wading in a stream of water in which untreated sewage flowed.

Paratyphoid fever is relatively rare but those epidemics which have occurred were spread by methods similar to typhoid fever.

Septic Sore Throat and Scarlet Fever

There have been numerous milk-borne epidemics of these two diseases. Research work has shown that there probably is not much to distinguish these two diseases when they occur in epidemic form. Both are caused by the same streptococcus organism and during an epidemic about one-half of the cases are typically scarlet fever, while the other half are typically sore throat. It is generally admitted that scarlet fever is nothing more than septic sore throat plus rash.

As in typhoid fever, the active case and immune carrier are the chief sources of the infection. These diseases are unique, however, because the udder of the cow may be infected by the carrier or active case. This organism may produce typical mastitis. It is difficult to eliminate the infected cow from the herd and usually requires a bacteriological examination of the milk from each quarter of all cows in the herd. If a bacteriological examination reveals the presence of a streptococcus organism which produces a marked hemolysis of blood agar, one should be suspicious of an organism of human origin. The streptococcus organism that commonly causes mastitis and is of bovine origin is not as hemolytic as the streptococcus of human origin.

Gastroenteritis or Food Poisoning

Acute food-poisoning epidemics have been traced to milk supplies. The causes are variable. Generally speaking, there are three agents which may cause this: first, and most common, is the toxin of *Staphylococcus aureus;* secondly, infection with *Salmonella enteritidis* or other Salmonella microorganisms; third, poisoning by the alkaloid, trematol, which causes trembles in cattle and which is derived from two plants, the white snake root and the ragless goldenrod.

The toxin of *Staphylococcus aureus* is by far the most common cause of milk-borne food poisoning. This toxin is produced in milk and milk products while standing in containers and may also be produced in the udder of a cow infected with the organism. The toxin produces in man an acute nausea, abdominal pain, and diarrhea two to three hours after consuming the contaminated milk. Many of these epidemics have been traced to one or two cows in the dairy herd. Since mastitis in cows caused by the staphylococcus does not spread rapidly through the herd, individual cows that are infected may go undetected. It is probable that staphylococcic mastitis is more prevalent than has been suspected and some surveys have indicated that such is the case.

Undulant Fever

Numerous cases of undulant fever occur in the United States every week which have originated from drinking raw milk from infected cows. However, not all cases are contracted through drinking raw milk, but some in handling the aborted fetus of cows and pigs with the bare hands. The organism localizes in the genital tract and udder of the infected cow. When the animal is heavily infected and the blood test shows a positive reaction in the 1: 200 dilution she is likely to give off the organisms in the milk.

All cows supplying milk to be consumed in its raw state should be blood tested at least every six months and found to be free of the disease. Every consumer of dairy foods is justified in insisting that this protection is afforded him.

Tuberculosis

As a result of the continued efforts of the United States Bureau of Animal Industry and state agencies, bovine tuberculosis is becoming eradicated from the cattle herds of the nation. But continued vigilance must be practiced to keep the disease from cattle herds. Herds will quickly become infected with this disease if they are not checked at yearly intervals. The dairy industry can contribute a great deal to public health by insisting that all dairy

animals be free of tuberculosis. The human tubercle bacillus may be discharged into the milk by tubercular people if they are allowed to work around dairies.

Miscellaneous Diseases

Diphtheria was at one time spread by milk supplies. The milk was usually contaminated by an infected person. This disease is becoming so rare in man that cases contracted from infected milk have not been reported for a number of years.

Cowpox may at times infect the hands of milkers and may even become general over the body. Cases of smallpox in humans have been known to cause the disease in cows and be transmitted back to the milkers.

The transmission of rabies through milk is doubtful. Experiments with rabbits have shown that it does not occur.

There is some evidence that infantile paralysis may be spread through milk; therefore, special care should be given the milk to protect it from contamination during epidemics of the disease in a community.

***2,4-D for Corn.*—If you are considering testing 2,4-D in your cornfields next year to control weeds, the work at Michigan State College will be interesting. Sweet corn planted on plots treated with 2,4-D withstood a heavy wind when plots on untreated soils suffered damage. On the 2,4-D treated plots, brace or "prop" roots developed, and were a major factor in keeping the corn upright after a severe storm. Apparently, the chemical acted as a root stimulant.**

Application of the spray was made immediately after planting. The spray consisted of a 70 percent preparation of the sodium salt of 2,4-D. It was applied to the surface with a knapsack sprayer at the rate of 5, 10, and 20 pounds per acre. During the cool, wet, early summer and warm, dry midsummer, weed control was effective with 5 pounds of 2,4-D per acre. Growth, yield, and quality of corn were not affected. Larger applications of the chemical tended to retard growth somewhat.

—Successful Farming

A British Farmer's Story

Peter Howard

TOM'S the boss in London. And Tom's the boss on Galley Hill. Though which is Big Tom and which is Little Tom remains a matter of opinion.

The first is Tom Williams, the Minister of Agriculture, telling the world we are going to grow more food in Britain. The second is Tom Beeton, my tractor driver, the fellow who must grow that food—and he is monarch of hedge, ditch and headland as he steers my heavy tractor round the fourteen acres of Galley Hill, cutting and binding wheat.

Tom Beeton has manured every one of my 347 acres of heavy East Anglian land with his sweat. For eight harvests, eight seed-times and eight summers, together we have grown wheat, barley, oats, beans, peas, sugar beet, potatoes, mangolds, kale and clover. Sometimes we have turned up our sleeves to help milk the cows. We have fed the pigs and even helped out with the poultry.

Harvest mornings the sun rolls lazily out of the east above Milden church. And Tom Beeton has walked with me among the wheat which lolled heavy and red unto harvest. Our boots soon are soaking and, says Tom, "A rare dag this day" (Dag is the Suffolk word for dew).

So until ten or eleven o'clock, when the sun has dried out the fields enough for the binder-blades to cut without clogging and jamming, we, like thousands more British farmers in these harvest weeks, cart muck from the cattleyards to the stubbles. Already our ploughs are active among the sheaves turning new fertility into the soil for harvests yet unsown.

Then, after a hunk of bread and cheese and a bottle of cold tea, Tom cranks his tractor into life, the binder is drawn into Galley Hill with its sails flapping in the wind, and away we go.

The blades cut the wheat. Canvas rollers carry it up into the bowels of the machine from which it is regurgitated in neat bundles bound with twine.

As hour follows hour, Tom's face grows black with the dust from the earth and the fumes from the tractor. Once or twice there is a break. The machinery is getting old and replacement is impossible.

But Tom outs with his jack-knife and dives under one section of the contraption like a ferret after a rabbit, emerging from another quarter triumphantly after a few moments—and away we go again.

As the strip of wheat grows smaller, boys from the village appear mysteriously on bicycles. They carry sticks and catapults. And as the rabbits which have fattened themselves on my corn dart out towards the safety of the hedge, the boys bag every one.

As the sun squats a moment on the western horizon before turning in for the night, Tom Beeton hauls his bicycle out of the hedge where he laid it at six o'clock that morning. Cocking his eye at the weather, he says to me "It'll be a rare day tomorrow."

"They say we've got to grow more grub, Tom," I say. "Well, I reckon the old land is hungry," answers Tom. "But there you are. If we do our best, I reckon it'll do its best too. Goodnight, Mr. Howard."

Yes, the land is hungry. In these last years we have been cutting down its rations and increasing its quota of toil. For the soil is a living thing. It feeds on muck —straw trampled into fertility under the hooves of cattle and spread back over the fields in return for their unending bounty. But since 1939 we have been taking heavier and heavier crops off the soil and putting less and less fertility back into it.

It is true that we have 300,000 more milking cows in Britain today than in 1939. But there are seven million fewer sheep in our pastures. Three million fewer pigs snore and swill in the sties. Twenty-five million fewer chickens and cockerels cluck and crow around our yards.

At the same time we have more than doubled our home-grown crops of wheat, barley and potatoes, while our yield of oats, fruit and vegetables has gone up by fifty per cent.

Can we now increase the yield of British farmland? Can we grow a crop of dollars from the British earth to save the millions of dollars we must spend each day on imported foodstuffs? Of course we can.

Here are a few facts and figures from my own farming experience.

I compare the fruitage of my land in 1940 and 1946. If anything, the 1940 season was more favorable than last year to us.

In that time my yield from corn has multiplied threefold. I earned £4,048 ($16,192) for the sale of it in 1946 compared with £999 ($3,996) in 1940.

My herd of cows has increased. I am given premiums for quality by the Milk Marketing Board and my income for milk last year was £1,400 ($5,600) compared with £210 ($840) six years ago.

We are producing nine times the quantity of poultry and eggs.

Now turn to the other side of the balance sheet. In that time my wage bill has more than doubled itself. Outlay on seeds

has risen. My seed bill last year was no less than £745 ($2,980).

Tractor and machinery repairs have doubled because the stuff is wearing out and adequate replacements are still impossible to buy in Britain.

On the other hand, my bill for feedstuffs for animals has fallen. It was £465 ($1,860) last year compared with £1,579 ($6,316) in 1941.

I have maintained and even increased by one-third my stock on the farm, but I cannot buy foodstuffs for them. So I have to devote over eighty acres of my land to feeding the beasts.

My overall revenue has multiplied by three in the last six years, my overall yield—including non-cash crops like kale, hay and mangolds—has multiplied by four.

My total expenditure is £1,700 ($6,800) a year, more than it was before and the cost of running the farm has risen from £17.10s. ($70) to £23.15s. ($95) per acre.

Over these next three years, given reasonable weather conditions, we calculate that we can still further increase our output of food by as much as 33 1/3% and at the same time maintain the capital fertility of the soil.

I am no farming expert. For years I worked in newspapers. But since the start of our farming enterprise, my wife and I have operated on one simple principle. It is to farm for the country, rather than to balance every operation in terms of the maximum cash returns—to try to fill larders with plenty of food, instead of merely to fill the Howards' pockets with money.

Governments so often make the mistake of dealing with the agricultural industry in terms of expediency. When the national cupboard is bare, the farmers are flattered and ushered through the front door. When the table groans through industrial prosperity, the farmer is often kicked into the backyard.

That is why farmers and farm workers, dealt with in this way, sometimes treat the land likewise, and that is why millions of acres lay idle between the wars.

A nation's attitude to its earth is the yardstick of its materialism. The land demands hard work and long hours before it makes its yields.

If Britain today decides to use her land to the full, no matter what turn world economy may take, to raise up a new generation of men and women who are content with a way of life which is a way of service, she will have taken a step beyond her crisis of moral apathy into a career of new greatness.

And Big Tom and Little Tom together will hand on a fresh inheritance to our children.

Breeding Efficiency as a Factor in a Herd's Financial Success

Condensed from The Hereford Journal

Carl W. Gay
Department of Animal Husbandry, Ohio State University

EFFICIENCY is one of the overworked words in the English language, so it is said, but it is a most comprehensive word and one for which there is no good synonym. The engineer and the business man are in a position to know more of its full significance than the stockman since they have been giving it more consideration.

The efficiency engineer is an important factor in the personnel of the industrial plant, who surveys production and management with the view of devising ways of increasing the former or at least securing a stated production at least cost and setting up such a system of management as will insure greater net income. The mercantile establishment employs merchandising and accounting experts to determine the causes of any losses shown by certain departments and what can be done about it, while increasing income from sales in others.

The cow tester, of all livestock people, comes nearer to serving in a capacity parallel to that of the efficiency engineer in the industrial plant. In fact, he is the efficiency engineer of the dairy farmer. He figures costs and balances them against production, thus fixing the sources of both profit and loss so far as the cows, the individual production units, are concerned.

Feeding has been considered the most important single item of livestock management, but as a result of the more general practice of record keeping the wide spread in relative efficiency of breeding males and females is revealed and breeding assumes a place of comparable importance to feeding in livestock management.

The successful operation of a livestock farm is a much more complicated enterprise than it used to be. Competition has compelled livestock farmers, like other manufacturers, to operate only the most productive units in the most efficient way. Margins of profit are frequently so close as to necessitate the most careful attention to production costs. In

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many instances death losses, and impaired productive and reproductive capacity, resulting from disease, turn profits into losses. It is essential, therefore, that the stockman so manage his herd as to insure highest production and reproduction at least cost with fewest losses from death and disability.

Selecting the best and culling out the poorest reproducers on record of their performance, is as effective a means of increasing livestock profits as selecting and culling the producers of meat, milk, wool or horse labor on the basis of individual merit. Moreover, while reproductive, like productive, ability may be inherited, management based on the laws of physiology may have much to do in keeping breeding animals working at maximum inherited efficiency.

The purpose of this article is to stress the importance of reproductive rather than productive, efficiency and, since in this, the breeder must do his own efficiency engineering, to suggest ways and means of reckoning and securing efficiency in his breeding herd.

A regular and careful check on the percentage calf crop, the ratio of services to conception, the number of shy breeding cows kept in the herd, combined with such management of the herd as will best maintain full potency of the sires and fecundity of the females, constitute an effective means of bringing about a high state of breeding efficiency.

Percentage calf crop varies with circumstances but 100 percent is hardly attainable in a large herd. If hand bred, under closely controlled conditions, as in many purebred herds, the percentage of calves per cows may be well up in the 90s but on the range the number of calves per 100 cows will be considerably lower. Sixty-five used to be considered satisfactory but better management has raised the figure 10 points or more in some of the range country.

The range cow is pasture bred which is both an advantage and a disadvantage in so far as the conception rate is concerned. There is usually more than one service in the heat period which is favorable to conception. The cow ovulates, or ripens and liberates from the ovary, an egg cell, in from 24 to 48 hours after the beginning of heat. Therefore, the first service in the pasture-bred range cow may precede ovulation too long and the sperm cell die before the egg cell arrives in the oviduct for fertilization. The sperm cells live in the cow's generative tract only for a few hours, normally 20 to 24. The second service is the protection against this happening and is responsible for conception in the majority of cases. If it were not for this repeat service the con-

ception rate on the range would be even lower, since cows would be bred too early in heat.

Hand breeding should be timed so that sufficient time may elapse for the egg to leave the ovary and pass down the oviduct to be met and fertilized by the sperm cell coming up. From four to five hours, depending upon whether it is a heifer or a cow, should be allowed, after service, for the sperm to meet the egg cell. Cows vary a lot in the time they are in heat, ranging from 12 to 36 hours, but if ovulation does not take place until 24 to 48 hours after the first evidence of heat, cows should be bred in full heat, eight to 12 hours after onset, or even up to six hours after going out, depending upon how long they are in.

Studies on the rate of conception show quite a wide variation. Nebraska Research Bulletin No. 129 reports an average on 22,684 fertile cows to be 1.79 by natural service. The satisfactory range should be from 1.4 to 2. Anything higher than 2, or only half the cows settling on first service should be checked for causes. The great majority of cows, 60 to 70 percent, should conceive on the first service. When the record on the breeding sheet shows repeated matings, at regular or irregular intervals, it may indicate generative disturbances that can or cannot be corrected, thereby determining either temporary or permanent sterility. Even if the cow is finally pregnant, the record is against her as an inefficient breeder. The number of cows that ultimately conceive reduces rapidly with the necessity for repeating breeding, i.e., at the Ohio Experiment Station 65.6 settled at first service, 24.1 at second, 6.1 at third, 1.7 at fourth, while of those requiring five or more services only 2.5 conceived.

Shy breeding cows lower the herd performance materially and, like cows that are completely sterile, the causes of their inefficiency should be determined early, and prompt disposition of the cows made, in accordance with the findings. Much progress has been made in the diagnoses and treatment of breeding diseases and qualified veterinarians are now available to most herd owners.

It is important to have an examination of all troublesome breeding cows so as to ascertain which ones are definitely and permanently sterile and which ones may be returned to the breeding ranks following treatment. This should be the first step in the management of the herd for reproductive efficiency. As the efficiency engineer will say, "Operate only the most reproductive animal units in the most efficient way. Avoid death losses and impaired reproductive efficiency as

a result of disease. So manage the herd as to secure maximum production and reproduction at minimum cost with fewest charge-offs on account of death and disability."

In common cow talk this means the breeder should find out, as soon as a cow fails to pass over but must be rebred on three or four successive heat periods, what is causing her to miss and what can be done about it. If she is reported to be permanently sterile he should send her to market without delay. All costs on her should be stopped as soon as possible since there can be no further income except from her carcass. It costs money to keep any cow and this cost is dead loss if she is only a boarder.

Too many breeders are disposed to kid themselves along, in a case like this, resorting to a veterinary examination only as a last resort. This is an expensive and ineffective practice. A competent veterinarian's report that a cow can never have another calf can usually be depended upon. Few, if any, potential breeders have been sacrificed by acting promptly upon such advice. On the other hand, if her condition is only temporary, measures to alleviate it should be undertaken as early as possible, not alone to save expenses on keep, but before existing conditions become chronic and will not yield to treatment.

Once possessed of a herd of fertile cows they should be so managed as to maintain their fertility at a normal level. Means to this end may involve a choice between hand and pasture breeding, flushing the cows preparatory to service, special care of the dry cows, as it provides prenatal care of the calf, proper quarters and attendance at calving time, and accurate records of the herd.

The relative effectiveness of hand and pasture breeding has already been covered with the conclusion that the conception rate is higher with the latter. However, while it is almost the rule in commercial herds, pasture breeding is objected to with purebreds for two good reasons, notwithstanding its advantage in relation to conception.

The very fact that pasture breeding, on account of its more certain results, is often resorted to in females that have given trouble or definitely failed to conceive to hand service, is responsible for one objection to it. Cows and heifers so bred are suspected of being shy breeders or at least difficult to settle. The other objection is that no definite calving date can be anticipated and prepared for because the time of exposure to the bull leaves a leeway of usually 30 and sometimes 60 days in possible calving dates.

Flushing is an old English shep-

herd's practice which has been adopted quite generally by shepherds, also by many swine herdsmen and not a few cattlemen. It consists in so feeding the female that she shall be in gaining condition, not fat, when bred. It is believed to enhance the chance of conception taking place and puts the female in good fix to begin her pregnancy.

Dry cows are too often thought of as being non-productive and, therefore, deserving of no special care. This is distinctly bad management. Proper provision for the unborn calf via his dam is about as important at this time as later when he is at foot beside his mother. There is no time in the calf's life when he makes as great proportionate growth as during the period of gestation and this requirement must be met by the ration allowed the cow. At the same time excessive development, especially of fat, that may complicate matters at the time of delivery, must be guarded against.

Cows do very well calving on pasture. In fact, it may be the best place so far as sanitation and hygiene are concerned, and other cows seem to respect the newborn, but it is not a good place for a calving cow if any difficulty is encountered. A maternity stall subject to thorough cleaning and disinfection between calvings where the progress of the delivery may be watched and assistance rendered, if and when needed, is more desirable.

Complete and convenient records of dates in heat and birth dates are important to keep the breeder informed on the number of services per conception as well as to facilitate his making applications for registration that can be accepted by the breed association. Birth weights are a check on prenatal care and how size is holding up in the herd, by inheritance. Records of what disposition has been made of the animals, not now in the herd, furnish important information. Whether they went out as non-breeders or as victims of disease and at what age is helpful in evaluating family lines. With the record books available to breeders now, the time honored barn door should pass out as an instrument for recording events of importance in the herd.

The bull is the most important factor in herd improvement. The bull is more than one-half the herd. He is not only one of the two parents of each calf in a one-bull herd but, by virtue of his more careful selection and the higher price paid for him, he is more prepotent than any female to which he is mated. This fact is overlooked by many breeders who think of the sire as just half the herd. But no smart breeder about to found a herd would

budget his investment equally on a sire and individual females.

He might even, and with good judgment, invest as much in the bull as in all the females together, depending, of course, upon the size of the herd. The sire impresses the calves with the likeness of himself and his ancestors more than does any female to which he is bred. The bull's effectiveness in the herd will be greatly influenced by the following items of management: the balance between feed and exercise, the extent to which he is used, the time and condition of service and the season.

The ration of the breeding bull should be adjusted to his service, more ample and of narrower nutritive ratio when service is heavy. Of equal importance, especially in beef bulls that show a marked aptitude to fatten, is exercise to balance the feed intake. Many sires are rendered impotent by becoming too fat because of no provision for exercise.

Another common cause of impotence which good management will obviate is excessive service. Service should be graduated with the age of the bull, and the more the breeding season is spread out the more cows can be bred as the less frequent the services.

Some extremely short-legged, deep-bodied bulls have difficulty in serving after full feed and water. Their use should be timed, if hand bred, to avoid this difficulty. Some bulls are afraid to mount on slippery footing and should not be expected to do so. Neglect of trimming the feet may leave a bull's toes so long that he has trouble in mounting. It is best to provide a regular place for breeding.

The reproductive efficiency of bulls has been found to be a matter of season to a marked degree. The vitality of the sperm cells, as well as their concentration, has been shown to be highest during April, May and June, and lowest during July, August and September. In fact the reproductive forces of both bulls and cows have been found to be maximum during May and June, minimum during July and August.

To summarize, reproductive efficiency in breeding herds is best assured by a system of management which selects vigorous foundation stock, feeds them for best breeding condition and keeps them working by controlling disease which may threaten their loss or impair their breeding capacity.

Seek Best Market Type Swine

Condensed from The Ohio Farmer

W. H. Bruner

WHENEVER lard sells below or near live hog prices swine growers should be concerned. This past fall saw hogs reach $30 per hundredweight on the market while lard was selling at $24.50 a hundredweight wholesale. Most farmers who have been producing hogs the last 10 years will remember many changes in the market. For example, in 1939 and 1941 there was a real problem marketing lard. Shortly following this, World War II changed the situation as lard was needed for many war uses.

In 1939 the average live hog price per 100 pounds at Chicago was $6.57 while lard had an average wholesale price of $7.46 per cwt. In 1940 the average Chicago hog price was $5.71 and lard $6.39, while in 1941 hogs averaged $9.45 and lard $10.06. On October 26, 1946, lard reached the highest quotation on the Chicago market which was $40 a cwt. At the same time hogs were selling in the neighborhood of $24 a cwt.

October 21, 1947, lard was quoted at $24.65 a cwt. and hogs were $28.50 to $28.85 a cwt. Lard holdings as of October, 1947, in U.S. are over 60 per cent more than October, 1939.

With the above facts in mind and thinking what might happen in the future, swine producers in Preble County, Ohio, have been developing a program to produce efficiently a meat type of hog. This work started in the spring of 1945 under supervision of the Ohio Swine Improvement Committee and the agricultural extension service. It consisted of sow testing (production registry) and carcass cut-out data of market hogs. In 1946 and 1947 the program was augmented by placing two representative pigs per litter at weaning time in a central feeding station located on the Preble County fairgrounds. Another added feature was the weighing of litters at 150 days of age.

Pigs placed in the central feeding station were started on a uniform feed when they reached 70 days of age and detailed feed records were kept on each litter sample until market weight of 200 to 210 pounds was attained. During the feeding period all pigs were weighed individually every two weeks. At market weight one hog per litter was slaughtered and

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detailed carcass cut-out data was secured. Slaughtering was performed at Ohio State University under supervision of Professor L. E. Kunkle.

During the three-year period 139 litters were weighed on individual cooperators' farms at weaning time. A total of 62 of these litters qualified according to production registry standards as approved by all breeds.

In 1946 two representative pigs were selected from each of 20 litters and placed in the central feeding station located at the county fairgrounds. Only pigs from litters which were free from disqualifications of the Ohio Swine Improvement Program and which met the number saved and litter weight requirements at 56 days were put in the feeding station. In 1947 the central feeding station was enlarged to accommodate 29 lots.

The H. B. Meyer Packing Company, Cincinnati, cooperated with Preble County swine producers by providing cut-out data on market hogs of similar breeding to hogs in the central feeding station. Cooperators sent 510 head to the Meyer packing plant.

In the two years of the feeding station study 48 of the 49 lots produced pork with less feed than the standard established by the Ohio Swine Improvement Committee. The standard was 100 pounds pork produced with 380 pounds of feed or less.

In the same period approximately one-half of the hogs slaughtered at market weight met the certification standards of the Ohio Swine Improvement Committee as to cut-out value.

This study has been conducted in an effort to locate sources of desirable breeding stock which will enable farmers to produce efficiently the most valuable hog carcass. The program measures productiveness, nursing ability, gaining ability, individuality, efficiency of feed utilization, freedom of defects and finally a carcass of superior value that merits consumer acceptance.

21 Preble County swine producers cooperated in the program this year. These men had Hampshires, Big Type Poland Chinas, Spotted Poland Chinas, Chester Whites, Duroc-Jerseys, Yorkshires, Herefords, Berkshires, inbreds and crossbreds.

The above cooperators met recently with the State Swine Improvement Committee at Eaton, where the 1947 data were reviewed and definite recommendations made concerning a 1948 State Swine Improvement Program.

Elevated Dropping Pits

Condensed from Everybodys Poultry Magazine

W. C. Sanctuary

CHANGES in management and equipment in the poultry business seems to follow the pattern of a pendulum. Practices swing one way, then another, and finally settle down somewhere in between. That's what has happened with roosts, anyhow. For years we saw nothing except dropping boards. Then poultry raisers got fed up with the boards' disadvantages and swung pretty heavily to pits. Now we have been experimenting with a pit and dropping board combination which we call elevated dropping pits. They seem to combine the advantages of both systems with a minimum of objectional features.

There has always been a rotting problem with pits. No matter how well the floor was waterproofed they still rotted out. Floors on our elevated pits are still sound after three years' service, and even if they did not rot out they would be easy to replace.

The thing we like best about the elevated pits is that we can put more birds in a pen than we can when floor pits are used. That's important in cutting down the investment per hen.

We've seen several size pits, some here at the University of Massachusetts and others on private poultry farms. We like to keep them narrow enough so all birds get plenty of fresh air and a man can reach to the middle from either side for culling. Aside from that point, size doesn't seem to make much difference.

Birds are more comfortable and respiratory infections are reduced when pits are placed in the rear of the pen but several feet away from the rear wall. Sudden weather changes don't affect the birds as much, either. Poultrymen who have used the elevated pits agree that they are easy to clean, droppings being scraped off into a wheelbarrow or carrier without any lifting. This allows nests to be placed on the rear wall, which often makes for efficiency.

Getting birds to roost has been no problem with these pits. We use lighting boards, and even Barred Rocks will hop up the 15 or 18 inches to the board, then another hop to the roost.

Rats are often a problem when conventional pits are usd. So far we have had no reports of rats using the elevated pits for winter quarters.

Reprinted by permission from Everybody's Poultry Magazine, Hanover, Penna., December, 1947

These are all advantages of the new pits. They have some disadvantages, too. It certainly is more difficult to catch or cull birds during the day with this equipment. But it is most convenient for culling in the evening to have the birds at waist-high level. Whether this is a disadvantage or not depends on when you cull.

In building the pits, we make the side boards 7 to 11 inches high and put this frame on a platform 25 inches from the floor, making the elevation from floor to roost 32 to 36 inches. When the litter is 5 to 7 inches deep the birds still have plenty of room to move around under the pits. Perches are 12 inches on center. A pit 9 feet 3 inches long by 6 feet wide has taken care of 100 birds.

We attach the side boards to the platform with three strong hinges which make it simple to swing the pit up and back for easy cleaning. Put plenty of axle grease on the hinges to keep them from rusting.

We have purposely crowded pullets in some pens where these pits have been used. On one farm 560 pullets were put in a 32 by 50-foot pen, giving each bird 2.86 square feet of floor space. They were heavies, too. The flock averaged 60 percent production for the year, reaching a high of 89 percent in the winter. All of the birds except 10 went up on roosts the first night of their own accord. No eggs were laid under the pits, a universal report so far.

In some of the pens we have elevated all the hoppers and fountains, too, giving birds as much floor space as possible. Our conventional hopper system may well give the birds too easy a life. A few hops up to a feed hopper each day may not hurt them any, and the exercise may give them better health.

We have what we call a "more-room" experimental pen at the University. We put holes in the sides of the pit near the top for ventilation. We don't have any proof that they are necessary, but they can't hurt anything and a little extra air should help when birds are sleeping over a mass of droppings.

There are no set rules or instructions for making these pits. Suit them to the pen size, material at hand, and your own preference. Try them in one pen if you need more roosting equipment. If your hens are like ours they are sure to like them. You probably will, too.

Extension Work in Japan

Condensed from Extension Service Review

Earl C. Richardson
Extension Editor, Michigan State College

JAPAN'S bureaucratic agricultural extension program may be remodeled to resemble the democratic program operating in the United States as a result of a study of the current plan by Russell E. Horwood, Michigan State College associate professor.

Horwood returned in late September from 12 months in Japan while on leave from his college teaching duties at East Lansing, Mich.

The last 9 months of this period, Horwood spent traveling over Japan studying the operation of the extension program and preparing recommendations for changes in its administration and operation. The proposed changes were made to the chief of the agricultural division of the natural resources section of the Supreme Commander for the Allied Powers.

The agricultural extension program in Japan is actually carried on by three different ministries and one semigovernmental agency, according to Horwood. The ministries are similar to our departments in Washington, D. C. Under them are bureaus, and even within ministries different bureaus operate some extension-type programs.

For example, the Ministry of Finance controls the extension programs in tobacco, salt, and camphor through the Monopoly Bureau. The regular agricultural extension program of the Ministry of Agriculture handles most of the programs but has no connection with the universities and colleges. These institutions, under the Ministry of Education, teach some agricultural courses and conduct research but have no connection with the Agriculture and Forestry Ministry. They conduct, in a limited way, their own agricultural extension program.

The semigovernmental agency is the All Japan Agricultural Association, to which all of Japan's farmers must belong. It is the marketing agency for all farm products in addition to having some regulatory powers and extension administration.

Horwood relates that little provision has been made for the spread of the information gained in research or at the extension demonstration farms. These farms number about a thousand and are

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set up to serve four to seven villages, or from 4,000 to 8,000 farmers each. Another 1,100 demonstration farms were included in the Japanese plan. The staff usually consists of a director (which would correspond in authority and duties to our county agents), a crops technician, a livestock technician, and two laborers.

The extension farm directors organize neighborhood associations in each farm area. These associations are made up of local agricultural technicians, school teachers, food inspectors, chiefs of food-production increase practice groups, and key farmers. The number varies from 50 to 80 in each neighborhood association. They aid with the farm work and receive instruction and training and act as local training and guidance leaders for the farmers.

It is by word of mouth—from these 50 to 80 persons—that the farmers obtain their information about crops, livestock, insect control, and other things. Because of the big shortage of paper, few if any bulletins are available. Few newspapers are available to carry information to the farmers, and the use of Government-controlled radio stations for agricultural information is limited.

Horwood says a number of the agricultural specialists in the lower level of the program are qualified and have good ideas. In the past they have been unable to develop and use them because of the dictation of the program from the top. Farmers themselves, Horwood says, are in many instances still afraid to express themselves. They are, however, becoming more democratic. Although limited, capable leadership is starting to take over from politically designated superiors who were incompetent from a technical agricultural standpoint.

Because of the shortage of natural resources such as coal and iron, the farmers are suffering from all of the economic problems of the nation as a whole. About 45 percent of the 77 million people in Japan are farmers or are in farm families. The average-size farm is 2 acres, which provides little room for livestock. Only 16 percent of the land is tillable.

In the northern part of the island are found most of the dairy animals. There are some purebred herds, and most of the animals are of Holstein descent. Production is exceedingly low because of a lack of roughage and protein concentrates. Top yields on the experimental farms for high-producing dairy animals are from 250 to 300 pounds of butterfat a year. Milk is a very scarce product in most of Japan.

Among the suggestions made for changing the agricultural extension programs, Horwood recommended a unified program flowing from the Ministry of Agriculture

and Forestry. This program would function through the universities and colleges and be coordinated with the proposed reorganization of agricultural research. Such a program, he said, should be entirely democratic to fulfill the desires and needs of the Japanese farmers.

He also recommended a youth program similar to 4-H Club work in the United States and a home economics extension program. Neither exists under the present program.

Horwood has faith in the Japanese people working out their own problems with the aid of the Americans. "They have great respect for the people from the United States and want to learn from us. Many are anxious to learn our language and get our books, bulletins, and literature on farming methods," Horwood said.

In Horwood's opinion, it will take a number of years to establish the occupation program in Japan, including the improvement of the agricultural economy of the nation.

***Pelleted Seed.*—Four hundred acres of tomatoes will be seeded directly in fields by farmers near California Experiment Station this season. Roy Bainer, agricultural engineer, says growers learned this planting method from the station's experiments with pelleted seed. In seed pelleting, small and irregular-shaped seed are coated to make them more uniform, with a better shape for use in new precision planters developed by several implement companies. These planters can space seed uniformly so considerable thinning labor is saved. When pelleted seed is planted, diseases of the planting bed are eliminated and the plant root system isn't disturbed by transplanting. Lettuce, onions, peas, and beans are being seeded this way.**

—Capper's Farmer

Rodents Eliminated by Chemical Controls

Condensed from Agricultural Chemicals

W. J. Hamilton
Professor of Zoology, Cornell University

RATS and their kin; ground squirrels, field mice and other rodents, have for untold generations plagued man. These mammal pests continually spread pestilence and disease, and destroy tremendous quantities of foodstuff which the nation can ill-afford to lose at any time, and particularly not during the present period of necessary conservation of food. Annual damage caused by these rodents in the U. S. has been placed at a third of a billion dollars.

Attempted control of these pests has been continued over the centuries often with only desultory results. Community effort is essential in any effort to reduce these losses. Poisoning, trapping, gassing and rat proofing have all received attention; but in large scale efforts to reduce rats and field rodents, poisoning has proved to be most effective.

The principal objection to poisoning is that most poisons used (excepting red squill) will destroy any and all animals which happen to eat the poisoned bait. There is also the likelihood of objectionable odors emanating from animals that have died within the recesses of buildings. A slow-acting poison, placed where rats have free access to the outdoors will minimize danger from such a hazard.

If poisoning operations are to be successful, the proper quantity of poison must be thoroughly incorporated with an attractive bait. Rats, unless starved, are fastidious creatures and will pass by what appears as a most attractive meal when other foods, more to their liking, are at hand.

In a campaign against rats, where poison is to be widely used, a preliminary trial of various food stuffs exposed to the rats will be most worthwhile. In this manner, one can best determine the predilection for any bait, and act accordingly. A list of baits that have proved satisfactory is given. These baits may be used as the base for any poison.

A. Cereals (cooked or plain), such as oatmeal, cornmeal, hominy, flour.
B. Meat, such as hamburg, bacon, suet, tallow, lard.
C. Fish, such as canned sardines, canned salmon, fresh mackerel, haddock.

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D. Milk products, such as raw milk, cheese, butter.

Melons, tomatoes, pumpkins, cherries, bananas, apples, and green corn are also excellent.

A large salt shaker, kept for the express purpose of mixing rat bait, is effective in coating melons, tomatoes, apples, and other fruits with poison. If a shaker is not available, the poison may be spread on with a knife or a wooden spatula carved from a shingle. If meat, meal, or dough is used, the poison can be incorporated with the fingers or a flat stick.

It seems hardly necessary to add that all foodstuffs should be removed in a poison campaign. To destroy rats, it is necessary that they eat the poisoned baits. The chances of this are greatly lessened if available unpoisoned food is lying about.

Many small baits are more effective than a few large ones. Furthermore, it is preferable to place the bait some little distance from the hole. This will prevent the rats from becoming unduly suspicious. In poisoning city blocks or large industrial areas, the poisoned bait should be wrapped in small squares of wax paper or paper cake cups to facilitate retrieving the baits. It is imperative that all uneaten baits be removed, and either buried or burned.

Prebaiting consists of exposing fresh unpoisoned baits, prepared exactly as the poisoned baits. The bait is put in places frequented by rats. It is best to use several kinds of foods, such as ground meat, fresh or canned fish, chopped or diced vegetables, and various cereals. By exposing such baits for several successive nights, one may determine the kind of bait favored by rats and where and in what quantity such baits are taken. By exposing a teaspoonful of the various baits side by side, the favorite bait may be selected. Uneaten baits are removed each morning and fresh baits are placed in the evening. When the most attractive bait is found one should wait a night or two before placing the poisoned baits. Although prebating may increase the chance of success in poisoning, it is not often done, and in times of food scarcity does not seem practicable.

Red Squill

Red squill is a perennial bulbous plant, *Uriginea maritima,* which grows wild in the Mediterranean area. The pear shaped bulbs weigh from one to ten pounds. It is necessary to dry red squill under controlled temperature conditions in order to obtain a powder of maximum toxicity. Sliced bulbs held at a temperature of 176° F. until thoroughly dried will provide the most toxic powder. The squill does not deteriorate if thoroughly

dried and kept in a tight container. Fortunately, red squill is a specific poison for rats, being relatively harmless to other animals. Domestic animals either refuse red squill baits, or if eaten, promptly vomit the poisoned food. Cats and dogs particularly indicate an aversion for squill.

Red squill powder is mixed with suitable baits at the ratio of one part of squill to sixteen parts of bait by weight. Poison can be incorporated with fresh meats or fish, meal, grains, or sprinkled on melon or tomatoes. The writer has mixed red squill with mash in poultry hoppers with considerable success. Due to its specificity and relatively harmless effect on animals other than rats, squill has met with great favor in agricultural use. It should be borne in mind that the relative toxicity of squill is less than other widely used rodenticides, with the exception of barium carbonate.

Sodium Fluoroacetate

The compound "1080" (sodium fluoroacetate) has been widely hailed as a rodenticide. Unfortunately, it is highly toxic to all animal life even in relatively minute quantities. It is therefore recommended for use only by responsible and qualified persons, such as federal, state, county and municipal officers, and experienced professional pest control operators. It is not recommended for use by the general public, and fortunately is not available to the public at the present time. Compound "1080" is chemically stable, is very soluble in water, but relatively insoluble in organic solvents such as kerosene, alcohol, acetone, or in animal or vegetable fats and oils. When powdered "1080" is exposed to air, it takes up water from the atmosphere and becomes quite sticky. It should not be heated above 270° F. in preparing any bait.

The high solubility of "1080" in water makes the preparation of baits easy and accurate. Baits poisoned with this compound are more resistant to weathering than baits carrying other poisons. There is, however, a hazard in contaminating drinking water. Since this poison is absorbed by the digestive tract in lethal quantities before its effects are felt, it is superior to many other poisons. Rats which survive one poisoning may develop an aversion to "1080" during successive operations, thus reducing the efficiency of the repeated use of this poison. All users of "1080" *must* realize that its presence as a contaminant in food or water might be unrecognized because of a lack of particular taste or odor. A coloring agent is recommended to differentiate the compound from flour, baking powder, or powdered sugar which "1080" resembles in its natural state. Op-

erators should neither smoke nor eat while handling the poison, in order to keep the hands away from the mouth. Compound "1080" should be used only in commercial or business establishments and on guarded municipal dumps.

As a rodenticide, it may be used in several ways. One-half ounce of "1080" per gallon of water is the recommended concentration. This preparation is effective against the three common rats and the house mouse. Poisoned water should be dispensed carefully by syringe in shallow ¾ ounce waxed paper souffle cups. About ½ ounce per cup is sufficient. The container should be placed at 12 foot intervals in prepared poison boxes or behind boxes and boards leaning against the wall. Following poison operations, the containers should be picked up and *burned*. If solid baits are used, one ounce per 28 pounds of food bait is recommended for the concentration. Thorough mixing is best obtained by mixing the bait with five times its own weight of wheat flour. Records should be kept of the locality and number of all baits and particular effort made to recover all uneaten baits at the close of operations.

"ANTU" Effective

Antu (Alpha-Napthylthiourea) is a relatively new rat poison. It was developed and tested by Dr. Curt P. Richter of Johns Hopkins University, and within the past two years has gained wide acceptance. Antu is an effective poison for the brown or Norway rat but is not particularly effective for the roof and black rat or other rodents. It has a high toxicity for the brown rat and a relatively low toxicity for other rodents. This compound is a finely granulated gray powder, insoluble in water but soluble in some organic solvents including ethyl alcohol and acetic acid. Antu is chemically stable, non-volatile, non-toxic and non-irritating to the human skin. Compared with other rodent poisons, Antu ranks second only to "1080" in its toxicity to the Norway rat, requiring approximately 7 milligrams of poison per kilogram of body weight to kill 50 percent of the animals. The Norway rat quickly builds up a tolerance for Antu, indicating that this poison should not be used in an area at intervals of less than four or five weeks. If additional control is required, squill, "1080," or some other poison should be used. Antu kills rats by causing an acute lung dropsy and an accumulation of fluid in the chest cavity. Death usually occurs within 12 to 48 hours. The first symptom of poisoning is a sharp drop in body temperature.

Antu is used in several ways. A 2 to 3 percent concentration in baits of the usual type, dusted lightly on and about freshly cut

vegetables; dusted lightly on the surface of water, and finally as a contact poison. This latter method is effective in eliminating the last survivors in rat-proofed buildings. Antu may be mixed with equal parts of dust, flour or pyrophyllite and placed in patches on floors against the walls, on cross studding or pipes. It may be blown into the burrows or holes with a standard dust pump, such as is used in applying "cyanogas." The writer has found this latter method most effective. Rats will lick the poison from their feet and thus ingest a lethal dose.

Zinc Phosphide

Zinc phosphide has been used widely in recent years for the control of orchard mice (*Microtus*), and is equally useful for rats. This compound is highly toxic and will kill all forms of animal life if eaten in proper amount. The poison is issued by agents of the Fish and Wildlife Service, U. S. Department of the Interior. It is issued in small cans containing 15 grams of the rodenticide, part of which is a filler. The contents of a can are sifted over two pounds of bait (for smaller lots, one teaspoon to 3 ounces of bait). Sifting the contents on two pounds of diced carrots or apples, or thoroughly incorporating with a large box of oatflakes, will prove effective in the control of orchard mice if the bait is placed directly in the runways of the mice. Broadcasting the poisoned bait in an orchard has proved futile.

Other poisons widely used in the U. S. and elsewhere are powdered white arsenic (arsenious oxide), phosphorus, strychnine, thallium sulphate and barium carbonate.

Arsenic

Arsenic is poisonous to all animals. It has the great advantage of being odorless and tasteless and thus makes a useful raticide. It is generally recommended in a proportion similar to red squill, roughly five percent. For best results, a high grade, finely ground quality must be used. If not completely pulverized, a slight grittiness results which detracts from its appeal. A pound of cornmeal slowly added to a can of salmon and pulverized with a spoon to make a homogeneous mass is recommended. After the two are thoroughly incorporated, two ounces of arsenic are added with a salt shaker, a little at a time. Baits the size of a hickory nut are then distributed. Arsenic dusted on diced carrots or apples is efficient in destroying orchard mice.

Phosphorus, Strychnine

Phosphorus is widely used in commercial rat poisons. It is usually prepared in the form of a

paste. Since phosphorus is dangerously poisonous to other animals, and no effective antidote is available, use of this material is not recommended.

Strychnine (strychnia sulfate) is a virulent poison, acting with great rapidity. Because of its bitter taste, some element must be added to overcome this fault. Twice the amount of baking soda will help to minimize the bitterness, and make the poison more acceptable. Strychnine should be used at the rate of one part of the poison to 80 parts of bait by weight. Since the poison works very rapidly, it is safer to use it on dumps rather than in buildings.

Thallium Sulfate

Thallium sulfate is a cumulative and powerful poison, acts slowly, but is positive in its results. It has been used for the destruction of prairie dogs, ground squirrels and other rodents as well as rats. It is used in a proportion similar to strychnine. The writer has used it in typhus control campaigns in Texas and elsewhere with excellent results, particularly in large cities. The poison should be handled with gloves and the bait wrapped in cellophane before placing in buildings. It is not considered safe to use about the farm.

Barium carbonate is a white salt, presumably odorless and tasteless. Mildly poisonous, its action permits the rat to leave the premises before death intervenes. The writer used this poison in many army camps during the war and directed its use in Germany's rubble, with excellent results. It should be used in the ratio of one part of poison to five parts of bait.

Thus the chemical warfare against rats and other rodents moves onward with new methods and more powerful materials coming into use. American agriculture has much to gain in ridding itself of the rat. Employment of the foregoing methods, used at proper times and in proper places, may go a long way in achieving this goal.

Science Is Not Enough—

Condensed from The Western Farm Life

Dr. I. E. Newson
Acting President, Colorado A & M College

SOME years ago the school children of France took a vote on who was the greatest Frenchman. Surprising as it may seem to some, the honor did not go to Napoleon but to Louis Pasteur. The scientist had replaced the warrior in the affections of the children and probably also of the people. It may be well to inquire what had brought about this transformation.

Pasteur was a chemist. He was asked to find out why French beer was not as good as the German beverage. Out of his studies grew the germ theory of fermentation. French wines were made the most popular in the world.

The silk industry was in a bad way. The worms died in the cocoons. Although new stock was brought from China, it soon became diseased. Who but Pasteur could find the cause? Needless to say he did. He worked out new methods of control and saved the industry.

From these accomplishments it was only a step to the vaccination for anthrax, for rabies and then to antiseptic surgery. Thus Pasteur by his labors practically saved the three chief products of France—wine, silk and wool. Not only that—he laid the foundation for all modern surgery, which recognizes that while skill in operation on the human body is not to be decried, prevention of infection is the basis on which success depends. Thus Pasteur, although a chemist, has become known as the father of bacteriology.

Since his time the world has looked to France for control of diseases of man and animals, for the management of all industrial fermentations and for the principles of sanitation. To work in the Pasteur institute was the height of achievement of the bacteriologist of only a few years ago.

Justus von Liebig was the great German chemist. In many respects he opposed the theories of Pasteur. He seemed to be blind as far as the action of micro-organisms was concerned. But he did establish the science of agricultural chemistry. He laid the foundation for the understanding of why plants grow. Out of his work grew the great German dye industry which has produced so many of

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our remedies for disease, including the sulpha drugs.

German chemistry almost dominated the world. Our sugar beet industry was developed in Germany. In order to start it here, we brought over German technicians. They showed us how to raise the beets and how to refine the sugar. Forty years ago a chemist who had not been to Germany could hardly be said to be educated.

In producing scientists, France and Germany led the world. Miracles undreamed of have been performed. If science alone could make a nation great, then these two should stand above all the rest. Science built the Maginot line, but the Maginot line was powerless to save France. Science prepared the Krupp guns. Science made the German Transportation system. Science unbridled, ruthless, almost succeeded in destroying the civilized world. Science can create, and science can destroy. *But science is not enough. The Maginot line was futile because the French army was morally rotten. German science failed because the leadership had decayed.* Buchenwald and Dachau were as much responsible for Germany's collapse as her lack of food and ammunition.

Stability is dependent on social and moral foundations. With power goes responsibility. Restraints are as essential as aggression. Science and education are handmaidens of progress, but they are not enough.

Ranges Without Hoppers

Condensed from American Poultry Journal

G. T. Klein
Massachusetts State University

THERE were ranges in Massachusetts last year, plenty of them, that did not have a hopper. In this new method, there is a considerable saving in equipment cost as well as in feeding time. Then, too, you can get the pullets to graze where you want them to, making better use of the feed the range can furnish.

Another consideration that enters here is the saving of mash lost by birds hooking it out of the hoppers and by the wind blowing it. The cost of pelleting runs but 7 to 10 cents a 100 lb. bag. This more than makes up for the waste. Also, we've seldom had trouble from rats on a range where there are no hoppers. And, too, in their effort to keep the range in better grazing condition, some poultrymen are clipping the range with sheep and the no-hopper plan saves plenty of aggravation if there are sheep on the range.

These are the reasons for this new method. It wasn't exactly a 1947 experiment, for it was getting a start before the war. Then came a scarcity of pellets, and the program was dropped.

When the pullets went to range at the Massachusetts State College Poultry Farm, we started the plan as soon as the birds were accustomed to their new home. They were around 10 weeks old, and it was decided they should have a ration consisting of growing mash pellets, and grain. The proportions would not be important, but the grain would make up a larger percentage than the pellets. That, at least, would not hasten maturity.

Then came the day to start the feeding of the pellets and grain. The pullets were kept off feed to be sure that they were hungry and would be eager to find feed. It was scattered on the sod near the range shelters. A lime spreader was used, and it was pulled slowly with a small tractor. It gave a distribution over a width of about 5 feet.

The proportion of pellets and grain were in the ratio of about 2 and 3. The first check on it, however, showed that the birds were not cleaning up the pellets. This called for cutting down on the grain and forcing more pellet eating. It was finally established in about those proportions, although

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we found it paid to continue checking the consumption of the pellets.

Then came the problem of feeding on the rainy day. The pellets would go to pieces almost immediately in such weather and be entirely lost. There seemed to be two possibilities. The pellets could be scattered near the shelters and in small quantities. They would be eaten immediately if the birds were hungry. Or the pellets could be replaced with grain for the feeding while the rain was falling. The latter plan has worked out best, and we cannot see any possibility of this upsetting the nutrition of the flock.

We feed 2,500 pullets 200 lbs. of pellets about 7:30 a. m. and 300 lbs. of grain about 4 p. m. This has to be adjusted from time to time to meet conditions that arise. It might be preferable in some instances to feed equal parts of grain and pellets. The feeding place is changed each feeding time. This makes full use of the range and the green feed it supports.

Some poultrymen are feeding all-mash pellets with no grain, scattering these twice daily on the range. This, in my opinion, is not as good a system as grain and mash feeding. It has the rainy day problem, and then there is the question of feeding these pullets after they are housed. It's less complicated to use a grain and mash system on layers. They never do better than if taught to eat on range the feeds they will have in the laying house.

I favor the grain and mash system, not because all mash or all pellets will not give high egg production or high hatchability. They will, but all pellet and complete mash feeding both give so much trouble with wet litter in laying pens that other feeding systems are preferable for this reason alone.

It would not be fair for me to represent pasturing of ranges with sheep as a widely used method in Massachusetts. Those who have used the system are favorable to it. However, sheep are troublesome about turning over hoppers and eating the feed and here is where feeding on the ground comes in. While sheep will eat some grain and pellets off the ground, they have no hoppers to bother. They will drink from the same waterers that supply chickens. The sheep are a little bother around the shelters and brooder houses but this is not extremely serious, and the shelters can be enclosed with a fence.

All in all, sheep do a good job of keeping poultry ranges grazed close and keep palatable nutritious grass coming along for the flock. Sometimes all of the difficulties mentioned here are avoided by ranging sheep on the pasture before the chickens are ready to go to range. Then the sheep go to another range but are later re-

turned if the grass outgrows the chickens.

There are a number of methods of scattering feed on the range. The lime spreader pulled by a small tractor has worked well for us at the University poultry farm. Some large producers have used trucks and road sanding outfits. Others scatter the feed from the back of a truck merely by opening a bag of grain or pellets and letting it run out on the ground as the truck is moving over the range.

There is a considerable saving in feeding time by not using hoppers. In our own case, 1 man feeds 2,500 birds in 10 minutes twice daily. This same range took 2 men 2 hours daily to feed a smaller number of birds with the old system last year. Then the men transported the feed in wheelbarrows.

One can think of many modifications of this system. It would be easy enough to have enough range hoppers for the pellets and to scatter grain on the ground. This would cut the objectionable wastage of mash. Perhaps there are many other plans—even better ones which we haven't tried.

There is no magic about this no hopper system. It is doing an equally good job at a considerable saving in time and investment in hoppers. It's one of the ways of cutting costs.

Soil Sleeps Under a Fodder Blanket

Condensed from Soil Conservation

Wellington Brink

At the tail-end of the 1947 harvest season I visited a number of farms in West Virginia's Panhandle to see some corn pickers at work. The new type picker carries a dual wallop. It helps lick the labor problem and, in addition, it helps to conserve the soil. On both scores, the advantages are so obvious that its popularity far outruns the available supply of machines.

The new corn picker saves labor, time and money. At one fell swoop it removes ear from stalk, husk from ear, carries the ear back to a wagon for hauling to the crib, cuts up or shreds the stalks, leaves the shredded material on the ground as mulch, and releases the land immediately for other use.

James H. Conklyn, district conservationist of the Soil Conservation Service, piloted me to key farms and key people in Morgan, Berkeley, and Jefferson Counties,

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all of which are included in the Eastern Panhandle Soil Conservation District. *He gave me a roadside view of field after field, bedded down with disked-over "fodder,"* some of them already sprouting wheat from new plantings. Well over half the corn is being mechanically picked and the "fodder" left on the fields as a mulch.

Julian Everly, who both farms and serves as secretary-treasurer of the National Farm Home Association, kept comparative cost figures for two comparable fields he owns, one hand-picked and the other machine-picked. He told me that it cost him $1.60 per shock—$20.80 per acre—to harvest by old-fashioned methods, as against $6.73 the modern way; and, of course, the machine gets the job done earlier, puts vegetation back onto the ground, and clears the way for the speedy planting of wheat over the whole field.

George S. Marlow, using a two-row picker, harvested 50 acres in 25 hours, and put 6,000 bushels in the crib in jig time.

John C. Welsh is known as an adventurous farmer. He has an experimental turn of mind, is a close observer. He started mechanical corn picking in 1940—probably the first farmer in his community to do so—with a one-row machine represented as having a seasonal capacity of 50 acres. Actually, he harvests as many as 400 acres. At top speed he shucks up to 700 bushels of shelled corn in 10 hours. *Welsh finds that the clover and grass* grow 6 inches higher after mulching. "I get 10 bushels more of wheat or barley as a result of the practice," he says. "The soil is spongier, the fertility higher. And, of course, the lessened erosion is a mighty important factor. The water slows down when it hits the mulch. And the vegetative protection also prevents splash erosion by raindrops."

By the middle of September this year Welsh was through with his picking and got his barley seeded promptly. It didn't come up for a month. He turned his cattle in immediately. The weather was dry. As soon as the rains came, he took the cows out of the field. But Welsh claims that he turns the shoats in any time. Last year they browsed until Christmas—"and I made 35 bushels of wheat." They love those occasional kernels when they are beginning to sprout in the corn-shucks, and the sprigs of young grain. And they pay for this good eating by leaving manure in the fields.

W. N. McClung, Berkeley county agent, figures that on his own farm the cost of harvesting by the old methods runs to 40 percent of the crop, or 16 bushels per acre. With mechanical picking, however, harvesting is accomplished for $6—or 3 bushels—per acre. "The food value of the fod-

der is more than offset by increased wheat production from mulching," he finds. "And there's another factor, sometimes overlooked. About 1 acre in 10 is taken up by the shock rows, which are eliminated when picking is accomplished by machine."

J. E. Saville, Jefferson county agent, points out that most pickers work at highest efficiency in the morning when the corn is not too dry.

Most farmers, however, report generally clean results under all harvesting conditions. A great deal depends upon the individual operator and still more depends on the machine and its equipment. Some farmers told me that sweet corn can be harvested perfectly.

Disking is very generally practiced—a method which effectively cuts up the stalks in the field and leaves the "fodder" as an excellent mulch. Still more modern, time-saving equipment is moving into this area, however—equipment which shreds the fodder, effectively crushes cornborers, and creates an even better mulch than disking.

George Heidrich, district supervisor, sees in the corn picker a great conservation tool, the implication of which extends far beyond its use in speeding crop to crib. The picker is an example of the fact that both farmers and manufacturers are becoming conservation-minded; that just about all modern farm gadgets are being developed within the pattern of the conservation idea, with a view to adapting every mechanical innovation to the furtherance of soil-conservation and soil improvement.

Increasing The Food Supply by Saving Feed

Condensed from Hog Breeder

C. M. Vestal
Purdue University

THE need for saving feed in livestock production is urgent, because feed saved is a means of producing more meat or using more grain directly as human food. Heavy curtailment of meat producing livestock on farms would be effective as an emergency measure in saving grain, but would upset our balance of food production.

If livestock consumed only grain which could be used for human food, then the competition for the grain would rest between man and the farm animals. The logical procedure in that case, in time of a food shortage, would be to feed fewer animals in order to feed more people.

Because, however, farm animals convert vast quantities of feed stuffs, such as hay, fodder, pasture, damaged grain and by-products of industry into meat and milk, it seems that the saving of grain for human food should be made as far as possible without depleting our herds and flocks.

This kind of feed saving is largely in the hands of the man on the farm, but feed manufacturers and dealers, along with workers of agricultural experiment stations and of the farm press, have an equal responsibility.

Feed manufacturers and feed dealers, by producing and selling efficient protein, mineral, and vitamin supplements to the feeders of livestock, can contribute effectively to the saving of corn and other farm grains, all of which are deficient in nutrients supplied by these supplements and, therefore, are improved by their use in the ration.

Because hogs consume almost one-half of the corn produced in this country, besides vast amounts of other grain and concentrate feeds, it is well to consider feed saving practices which may be applied to their production.

The economical use of corn or other grain in hog feeding is largely dependent on suitable supplementary feeds, most important of which is the protein concentrate. The value of 60% protein tankage as a supplement to corn in hog feeding has been demonstrated by many feeding trials at the different agricultural experiment stations. It has been shown that where corn is fed alone to

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fattening hogs in dry lot, at least ten or twelve bushels are required to produce 100 pounds of gain. If tankage is fed as a supplement to the corn, approximately seven bushels of corn and 25 to 30 pounds of tankage are required. These results show that 100 pounds of tankage or similar supplement are capable of saving ten or more bushels of corn, when fed with the corn to fattening hogs in dry lot.

While tankage is used to illustrate the point that a protein-rich supplement saves grain and increases the gains of hogs, some of the other protein feeds are equally as effective in these respects. In fact, feeding tests have shown that skim milk, buttermilk, and good quality fish meal are even more efficient than tankage in promoting rapid gains in hogs and in saving grain feed. It also has been shown that certain protein feed mixtures are superior to the single supplements for efficiency in hog rations.

A good pasture such as alfalfa or clover will save five to ten percent of the grain and 30 to 40 percent of the protein supplement in growing and fattening hogs for market. A wider and more intensive use of such pastures is one of the effective means of saving feed without reducing pork supplies, especially in times of a feed shortage. In certain feeding experiments in which a ration of corn and alfalfa or clover pasture was compared with corn alone fed to growing and fattening pigs it was shown that the pasture saved almost four and one-half bushels of corn for each 100 pounds of gain—almost nine bushels for a 200 pound hog. These tests also showed that 100 pounds of tankage fed with the corn and pasture saved 20 bushels of corn, as compared with feeding corn alone in dry lot.

Vast savings of grain can be effected by a more careful carrying out of these efficient feed saving practices on our farms. Furthermore, this can be done with an increase in the meat supply and usually a greater profit to the farmer or hog feeder.

One of the simplest and most often neglected means of saving grain in hog production is the feeding of common salt. Recent tests at Purdue University have shown how vitally important it is to give hogs salt free choice when receiving the typical present-day ration of corn and a vegetable protein supplement or a mixed supplement containing liberal proportions of the vegetable protein-rich feeds such as soybean oil meal.

The feeds of vegetable origin, whether grain, supplement, or pasture are deficient in the elements of common salt, as measured by the hog's requirements for salt. Therefore, it is more impor-

tant to feed extra salt with this type of ration than one supplemented with tankage or meat and bone scraps, which contain from 15 to 20 times more salt than the vegetable protein feeds. However, even with the use of the animal protein supplements, such as tankage, it is important to give the hogs salt free choice as a safeguard against a possible deficiency of this important ration ingredient.

Remarkable savings of feed and increased pork production as a result of feeding salt free choice to fattening hogs in dry lot were recently demonstrated in a Purdue experiment. Hogs weighing 90 pounds at the start were fed for a period of 85 days on a ration of corn, soybean oil meal, alfalfa meal and a simple mineral mixture. Hogs receiving salt free choice had an average weight of 255 pounds while those without salt weighed only 174 pounds after the feeding trial. More than two bushels of corn and 28 pounds of supplement were saved for each 100 pounds of gain in the salt-fed lot. For each pound of salt consumed there was a saving of 3.8 bushels of corn and 46 pounds of supplement in this experiment. Similar results were obtained in tests with growing pigs.

In another experiment where growing and fattening hogs were fed a ration of corn, soybean oil meal and a mineral mixture on alfalfa pasture, one bushel of corn and 20 pounds of soybean oil meal were saved for each 100 pounds of gain by feeding salt free choice, as compared with no salt in the ration.

Hogs need but little salt and eat small amounts when they have regular free access to it. The Purdue experiments show how vitally important these small amounts are for the efficient utilization of feed and the satisfactory health, growth and fattening of hogs.

The widespread belief that hogs are easily poisoned by salt is a limiting factor in the proper feeding of it on many farms. In tests at Purdue we have failed to produce poisoning by giving salt-starved hogs all the loose salt they care to eat. The free choice method of feeding salt to hogs at all times is the best insurance against salt hunger and its attendant bad effects, which are slow and costly gains, inefficient use of feed and general unthriftiness of the animals.

In the present feed-saving program, farmers are urged to market their hogs at lighter weights in order to save feed. This is an effective way to save feed and at the same time produce more desirable pork from the standpoint of consumer preference for leaner cuts of meat.

In growing and fattening hogs the feed required to produce a unit of gain increases with the

increase in weight of the animal. This is illustrated by the results of a feeding test shown in the table which follows.

Obviously, if the need is for more grain to be used as human food vast savings can be made by marketing hogs at lighter weights. On the other hand, if greater efficiency in the use of grain for the production of more and better meat is the objective, marketing hogs at lighter weights is still a part of the answer to our problem.

In the experiment on feed requirements, the total feed consumed by an individual pig from a weaning weight of 30 pounds to a market weight of 225 pounds was approximately 670 pounds. An additional 320 pounds of feed were necessary to carry the pig to a 300 pound market weight. On this basis, the feed saved by marketing 100 hogs at an average weight of 225 pounds, instead of 300, would be sufficient to feed 47 extra pigs from weaning to the 225 pound weight, and at the same time produce about 1700 pounds more gain on the hogs. Another evaluation of the amount of feed saved is that it would feed five sows while raising five litters of pigs, totaling 35 head, and also feed these pigs to an average market weight of 225 pounds.

The principle of saving grain by marketing animals at lighter weights or with less finish will also apply to cattle and sheep. These animals are the real consumers of the coarse feed stuffs on the farm, and thereby afford us a source of meat produced with a minimum of grain, especially when marketed short of the most desirable finish, as judged from a meat-quality standpoint.

Avoiding excess finish in all meat producing livestock is one of the most effective ways of saving grain. It also is a more desirable method than depleting herds and flocks in order to save feed.

FEED REQUIRED TO PRODUCE 100 POUNDS OF GAIN DURING THE DIFFERENT STAGES OF GROWTH AND FATTENING

Pig weights	Grain	Protein feed	Minerals	Total feed
lbs.	*lbs.*	*lbs.*	*lbs.*	*lbs.*
30– 75	250	44	1	295
75–150	290	34	1	325
150–225	349	31	1	381
225–300	403	23	1	427

Egg Farming With No Laying House

Condensed from Everybodys Poultry Magazine

Robert C. Baker

DR. GOODWIN, who owns Goodwin Farms in Venango County, Pennsylvania, wanted to go into the poultry business two years ago, but he didn't own a poultry house. He decided to start chicks early, let them lay five or six months on range, then sell them for meat. He tried it—and it worked.

New Hampshire chicks are started in early January. They are brooded in floorless brooder houses with wood burners. At 12 weeks of age the cockerels are sold for meat. This allows plenty of floor space for the remaining pullets. When the ground is dry and the weather warm, the pullets are put on a Ladino clover range.

The range shelters are not moved during the ranging season because it would kill too much clover. The feeders and waterers are moved each week to prevent bare spots from developing. There are five 12 x 14 shelters, housing 750 pullets, on the two-acre range.

When the pullets are ready to lay, two nesting houses are put on range. Each house has enough nests to accommodate 400 birds. The birds lay and live on range and don't know what a hen house looks like. When the weather gets bad, usually in early November, the birds are sold for meat. Some years pullets are kept on range and aren't sold until Thanksgiving time.

Dr. Goodwin reports that his 1947 pullets more than paid for themselves on profits from eggs. The returns from meat were clear profit. He is so satisfied with his present poultry setup that he doubts if he will ever build a hen house.

Similar systems of management are being used on other farms and work out well, particularly when the so-called "black pullet" (Rhode Island Red or New Hampshire male and Barred Rock female crossbred) is used. Pullets from this cross have been bringing a premium on live poultry markets for the past several years.

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Pounds of Fish Per Acre

A well-stocked and well-managed farm pond can be expected to produce as much meat to the acre for the family as if it were in good pasture. That's what Wallace L. Anderson of the soil conservation service says—and he presents facts to prove it. A yield of from 100 to 200 pounds of fish to the acre is not unusual and may run up to 300 pounds or more.

In a recent survey of about 100 ponds in the Middle West, about half were in good balance and productive. About one-third were overcrowded to a point where they were not productive. Ponds smaller than a quarter acre in size were difficult to manage. Good stocking calls for a mixture of fish, with the food fish preying on some less-desirable species for food. Over much of the United States the desirable stocking mixture is 50 large-mouthed bass and 500 bluegills to the acre of pond area if the pond is not fertilized, and double these numbers where fertilizer is used in the pond.

In a well-balanced pond the bass eat the bluegills and keep down their number to a point where the bass eggs have a chance to hatch. In a pond over-crowded with bluegills, the bluegills prey on the bass eggs so that there are few of the food fish. If the pond is in balance a few sweeps of a seine in late summer will show that the pond contains both bluegills and bass of the current year's hatch, plus a few bluegills two or three inches in length.

Recent experiments show that the best fishing results come from keeping the pond clear of weeds, and fertilizing it with an 8–8–4 analysis fertilizer. This encourages liberal growth of plankton (minute marine animals and one-celled plants). Fish feed on these as do worms and insects which in turn are eaten by both bass and the bluegills. Finally the bass prey on the bluegills and furnish sport and fish for the angler. To test a pond for the right supply of fertilizer, stick a bare arm into the water. If the hand is "blacked out" by the water above it, when the arm is dipped to the elbow, the fertilization is right and fish production should be good.

—*The Dakota Farmer*

Recommended for The Farmer's Library

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean, School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $3.50.

A Living from Bees—By Frank C. Pellett, Field Editor of American Bee Journal. Orange Judd Publishing Co., Inc. $2.25.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A & M College of Texas, College Station, Texas. The Interstate Printers & Publishers. $2.50.

Breeds of Livestock in America—By Henry W. Vaughan, formerly Prof. of Animal Husbandry, Iowa State College. College Book Co. $4.75.

Dairy Cattle Feeding and Management—3rd Edition—By H. O. Henderson, Prof. of Dairy Husbandry, W. Va. Univ., Carl W. Larson and Fred S. Putney. John Wiley & Sons, Inc. $4.50.

Dairy Science—By W. E. Petersen, Ph.D., Assoc. Prof. Dairy Husbandry, Univ. of Minn. J. B. Lippincott Co. $4.50.

Diseases and Parasites of Poultry—By Edgar Hugh Barger, D. V. M., Berkeley, Calif., and L. E. Card, Ph.D., Prof. of Poultry Husbandry, Univ. of Illinois. Lea & Febiger. 3rd Edition. $3.75.

Domestic Geese and Ducks—By Paul P. Ives, Pres. Am. Waterfowl Ass'n. Orange Judd Publishing Co., Inc. $3.50.

Elements of Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Dept. Agri. McGraw-Hill Book Co., Inc. $3.20.

Farm Records—By John A. Hopkins, Ph.D., Asso. Prof. Economics, Iowa State College. Iowa State College Press. $3.00.

Farm Management Manual—V. B. Hart, S. W. Warren, Ivan R. Bierly—N. Y. State College of Agri. Comstock Publishing Co. $1.00.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $6.00.

Forestry in Farm Management—By R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc. $3.50.

Grow Your Own Fruit—By M G. Kains, formerly U. S. Dept. of Agri.; Prof. of Horticulture, Penna. State College, Greenberg, Publisher. $3.50.

Hatchery Management—By Roland C. Hartman, Editor, Everybody's Poultry Magazine, and G. S. Vickers, Field Mgr., Ohio Poultry Improvement Asso. Orange Judd Publishing Co., Inc. $4.00.

How to Raise Rabbits for Food and Fur—By Frank G. Ashbrook, Fish and Wildlife Service, U. S. Dept. of the Interior. Orange Judd Publishing Co., Inc. $2.00.

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $3.00.

Land for the Family—A Guide to Country Living—By A. F. Gustafson, E. V. Hardenburg, E. Y. Smith, and Jeanette McCoy—N. Y. State College of Agriculture. Comstock Publishing Co. $4.00.

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"A garden is many things, a piece of man but also of nature, a textbook of economics, a stronghold of liberty, a means of safe-guarding the principle of personality, a vent for craftsmanship, a nurse of character, a condition of health and physical maintenance, a poem and a prayer: in brief, a way of keeping body and soul together."

—H. J. Massingham